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SCIENTISTS AND WORLD GOVERNMENT

Should the scientists organized in the Federation of American Scientists join the movement for world government? This question has troubled atomic scientists since 1945 when they first began to think of political action. For several reasons, they decided to make international control of atomic energy, and not world government, the first plank in their platform.

In the first place, the necessity of establishing international control of atomic energy, was obvious to *all* scientists; to subordinate this concrete aim to a more general program would have caused at that time, considerable dissention. Some felt that the solution of an urgent practical problem was weakened by predicating it on the achievement of a vague, unattainable ideal. Others were afraid that raising the question of world government would jeopardize the chances of an atomic energy settlement with the Soviet Union.

The majority of scientists were aware even then that no system of international control of atomic energy could long survive without the establishment of an authority with power to render national states incapable of waging *any* kind of war, atomic or "conventional". However, they believed that scientists can contribute most towards the ultimate creation of such an authority if, instead of joining forces with the groups which have written "World Government" on their banners, they concentrate on educating the peoples of the world and their leaders to the dangers of international lawlessness in the atomic age, and thus help to create the psychological background for the acceptance of the radical decisions necessary to end this lawlessness.

Physicists know that effects produced by a certain cause depend on two factors—quantity and intensity. In mechanics, it is the product of mass and velocity that determines how deeply a pile driver will drive into the ground; in electricity, it is the product of charge and potential that determines how much heat and light will be generated by an electric current.

In political life, too, the effectiveness of a movement depends both on the number of people who support it and the intensity of their convictions. With justifiable satisfaction, the world government groups point to the large majorities which their program has received in recent polls of public opinion or in actual popular voting, such as the Massachusetts referendum of a year ago.

These majorities undoubtedly are significant; probably they could not have been obtained two or three years ago, and reveal a rapid evolution of public opinion. But precisely how much they mean in terms of possible political action depends on whether the voters who agree that world government is *desirable*, also feel strongly that it is *urgently necessary;* and of this, there might be doubts.

The same people of Massachusetts who overwhelmingly endorsed the idea of world government, sent men to Congress more likely to obstruct than to speed up the achievement of this ideal. Price control, taxation, patronage, racial discrimination, labor legislation, even foreign issues, such as attitudes towards Britain and Russia, these questions really stirred the voters and determined their choice; it did not occur to them to examine their candidates as to where they stood on world government.

If the world government cause is to triumph it will need more than sympathetic endorsement by the majority. People must be made to feel that their own security, freedom, and prosperity, yes their very survival, depend on the creation in our time of a world rule of law. They must be made to believe that the establishment of a world government is more urgent than the maintenance of a high domestic standard of life and as, if not more, practical than the pursuit of a deceptive security by full military preparedness.

Whatever feeling of urgency exists behind the American sentiment for world government probably is traceable to Hiroshima and Nagasaki. The lesson of the atomic bomb, driven home largely by the scientists' activities—which some have dismissed as "scaring people without showing them what to do"—probably has done as much for the *intensification* of the world government appeal as the activities of outright world government groups have done for its numerical growth.

The scientists who prepared the ground for the Lilienthal-Baruch-UN plan, are still lending and will continue to lend it their full support. They will also support any satisfactory alternative plan which may emerge in the course of negotiations. They will do so not because they are so naive as to believe that international control may successfully endure in a world of rival national sovereignties, although this was imputed to them by some critics (for example by Mr. Borgese in his article, Of Atomic Fear and "Two Utopias," *Common Cause*, Vol. 1, No. 3). Rather, they will do so because the closer the atomic energy control program, or other practical attempts to establish international community of action come to success, the wider will be the recognition that the present rivalry between sovereign national states can be eliminated, and the stronger will be the demand for the abolition of a system which obstructs the operation of mechanisms of international cooperation.

Three possible developments could be anticipated when the atomic energy negotiations got under way:

A system of control could be agreed upon, ratified by the major natiens, and put into operation, only to be continuously endangered and, sooner or later, completely stymied by recurrent international tensions and rivalries.

An agreement could be reached in the UN Commission, and a blueprint of control organization prepared, but would prove impossible of implementation because of insufficient mutual trust and unwillingness to cooperate of nations belonging to different economic and ideological camps.

The third possibility was that from the beginning the divergent interests of national states would be so strong that no agreed plan could be put forward.

The closer the plan of an International Atomic Energy Authority had come to realization, the more violent and widespread would have been the reaction if obstruction by national states had prevented its initiation or made its operation impossible after an initial success. The more intense and spontaneous will be the desire of the nations that the obsolete political structure which so obviously stands between them and their security, be changed, cost what it may.

The first possibility was most desirable—not only from the point of view of elimination of an immediate threat of atomic warfare and consequent relaxation of international tensions, but also from the point of view of demonstrating the feasibility of a supra-national authority and the advantages which accrue to all nations from its existence. The chances for this development were slim to begin with, and have been reduced almost to zero by the rapid deterioration of Russo-American relations during the last two years.

The prospects for the second outcome have perhaps not yet quite vanished. The Soviet concessions in the UN Atomic Energy Commission, taken at their face value, are far-reaching enough to make a compromise plan feasible, a plan which would contain less international ownership and management and more inspection than is envisaged in the present majority proposals, but with enough teeth in it to assure—if it could be properly implemented—an effective prevention of clandestine manufacture of atomic weapons.

But perhaps, what is now taking place in the UN Commission, should not be taken at its face value. Perhaps, in the realization that no agreed plan could be implemented under the present conditions of international strain, neither side is really anxious to achieve a compromise, but prefers to stick to proposals which are demonstrably unacceptable to the other side, so as to be able to attribute the deadlock to the stubbornness of the opponent.

Even as things stand now, the manifest difficulties of an agreement on atomic weapons, coupled with the spreading knowledge of what a war with such weapons will be like, probably constitutes the most potent object lesson for world government.

As far as the scientists are concerned, this lesson has been quite sufficient. When the "Lake Geneva Program" adopted at a conference in June, and since then endorsed by the member associations of the Federation of American Scientists, committed the scientists to the recognition of world government as prerequisite for the stable solution of the atomic energy problem, no dissenting voice has been heard, neither from the "conservative" nor from the "radical" side.

The question of participation in the drive for world government may soon confront the scientists' organizations in a more concrete form. In this issue of the BULLETIN, we print the articles by Mr. Henry Usborne, Member of Parliament, and by Mr. Joseph Mayer, dealing with a new development in this drive—the plan to hold a world constitutional convention in 1950. The adoption of the Lake Geneva program, and the fact that the Usborne proposals appear to have united the separate and, in the past, often discordant, world government organizations, make active participation of the scientists' groups in the preparation of the convention both possible and desirable.

However, if the reasoning given above was correct in the past, it remains correct now, and at least for some time to come. Even if the scientists themselves are now fully convinced that without a world government in our generation, no temporary solution of the atomic energy problem will be durable enough to prevent the next war, this does not mean that they should cease their present educational activities, abandon their interest in the UN Atomic Energy negotiations, or other partial plans for relieving international tensions.

Scientists must remember the path which brought them to the unanimous realization of the necessity of world government. Their special task, which none else can perform with equal authority and chance for success, is to lead others along the same path, so that more and more people may arrive at the same conclusion—that political likes or dislikes must be subordinated to the urgent common cause of establishing, within this generation, a community of mankind under enforceable law.

E. R.

LETTER TO STALIN

Leo Szilard

In 1939, Dr. Szilard, as is generally known, took the initiative in bringing to the attention of President Roosevelt the scientific experiments which indicated that an atomic bomb was a possibility. This first step resulted in the mobilization of resources and skill which led to the atomic bomb. In the present article, Dr. Szilard discusses how Mr. Stalin, by taking the initiative, could in time resolve the present deadlock. Dr. Szilard would have preferred not to have published this article but rather to have sent a letter to Stalin dealing with these matters if permission to send such a letter, within the meaning of the Logan Act of 1799, could have been obtained. The memorandum on page 351 which he presented to Mr. Byrnes some time before the first bomb was tested in the New Mexico desert illustrates the type of clear thinking which forecast the present difficulties.

I take the step of writing this "Letter" because I am deeply concerned about the deterioration of Russian-American relations, and also because I believe that the general sentiment which moves me to this action is shared by the majority of the atomic scientists who take an active interest in matters of public policy.

The steady deterioration of Russian-American relations has many disturbing aspects, but perhaps none is as serious as the lasting effect which it may have on the minds of the American people, as well as the minds of the people in Europe and elsewhere in the world.

Here in America more and more men will say to me in private conversation that war with Russia is inevitable. These are men who are capable of thinking independently and are not guided by whatever editorials they may read in their newspapers. To me their attitude is a symptom of grave danger because, once the American people close their minds on this subject war, in fact, will have become inevitable.

There are those who argue that there is no danger of an early war because at present Russia is too weak to start one and there is no precedent for the United States embarking on a preventive war. That there is no such precedent is, of course, true; but neither have the American people ever before been in a position where they had to fear that if they remain passive during a protracted period of uneasy peace they may live to see the day when war—if it breaks out—will be brought to their homeland.

I do not mean to say that the United States may start a preventive war against Russia within the next six months; what I mean to say is that if the present trend continues for six months, a fateful change might take root in the minds of the American people and the situation would then be beyond remedy. Thereafter it would be merely a question of time—a few short years, perhaps—until the peace would be at the mercy of some Yugoslav general in the Balkans or some American admiral in the Mediterranean who may willfully or through bungling create an incident that will inevitably result in war. If the present trend continues for six months, more likely than not, the further course of events will be out of the control of the two governments involved.

The main reason for the present trend is the fact that two years have passed since the end of the war and no appreciable progress has been made toward a settlement. Russia and the United States have reached a deadlock.

All this does not come as a surprise to most of us who had worked in the field of atomic energy during the war and had time to adjust our thinking to the implications of the bomb. It was clear from the start

The following is part of a letter which Dr. Leo Szilard sent to the Attorney General under date of October 25, 1947. The article as printed is a revised version of the manuscript originally submitted to the BULLETIN and the Attorney General.

Enclosed is a copy of an article entitled "Letter to Stalin" which I have submitted to the BULLETIN OF THE ATOMIC SCIENTISTS for publication.

If it were in every respect proper for me to do so, I would write a letter to Mr. Stalin embodying the thoughts contained in the enclosed article and would seek some way of transmitting such a letter to him through the good offices of some prominent person who is known to him. It would be my hope that if my letter were transmitted to Mr. Stalin in such a manner he would perceive the genuine anguish which prompted my writing it and that he might therefore give consideration to its contents.

If such a letter were in fact to be transmitted to Mr. Stalin through some proper and desirable channel I would probably want to postpone indefinitely the publication of the article.

The enclosed article does not touch on any specific dispute or controversy with the United States and the letter which I would send to Mr. Stalin would merely follow its text, possibly shortened by omissions. You may, in the circumstances, think that the transmission of such a letter would not come under the Logan Act of 1799. On the other hand, you might think that the transmission of such a letter might come under the Logan Act or some other similar act and therefore, in accordance with the Logan Act, I am herewith making the formal request for permission or authority of the Government for the transmission of such a letter in the meaning of the Act.

that the existence of the bomb and the manner in which it was used would not make the settlement easier but rather more difficult. We knew that the world could be saved from another war only if both the United States and Russia were able to rise above the situation, and before this can come to pass one of them will have to take the lead.

Situations of this general type are not without precedent in history; they occur also on occasion in the lives of individuals, and the story of one such occurrence made a very deep impression on me. In 1930, twelve years after the end of the First World War, I met a classmate of mine and we talked of what had happened to us since we had separated. He had been a lieutenant in the Austrian Army, and in the last days of the war in the Carpathian Mountains he was in charge of a patrol. One morning they had heard by way of rumor that an armistice had been concluded, but being cut off from communications they were unable to obtain confirmation. They rode out on patrol duty as usual, and as they emerged from the forest, they found themselves standing face to face with a Russian patrol in charge of an officer. The two officers grabbed their guns and, frozen in this position, the two patrols remained for uncounted seconds. Suddenly the Russian officer smiled and his hand went to his cap in salute. My friend returned the salute, and both patrols turned back their horses. "To this day," my friend said to me, "I regret that it was not I who saluted first."

Perhaps by writing this "Letter" today I may make some slight amends for my friend's tardiness, for in these troubled times it is not without some personal risk for an American scientist to write a "Letter" such as this one.

Today Russia and America find themselves standing face to face, each of them fearful of what may be the other's next political move. The American people want peace. The Russian people want peace also.

As I see it, Russia wants peace—as does the United States—not only for the next five or ten years, she wants peace for good. And if I am correct on this point then peace can yet be saved; it can be saved by you, yourself.

It is within your power to resolve the deadlock and thereby to permit a change in the course of United States foreign policy, but you can do this only if you decide to throw off the self-imposed shackles of the old-fashioned, and also of the new-fangled forms of diplomacy.

Russia and the United States are deadlocked on almost every point on which they have negotiated in the recent past. On every such point, Russia may have very good reasons for not yielding, and the United States may also have very good reasons for not yielding. I am not going to suggest that you should now yield on this point or that one, or that you should now "appease" the United States.

THE APPROACH SUGGESTED

What I am suggesting in this "Letter" are a series of interconnected steps which are within your power to take. Because they are most unusual steps, these suggestions may appear quixotic to many and ridiculous to some.

What I am suggesting in this "Letter" may come somewhat as a shock to you. It may also come as a shock to some of my fellow-Americans who will read these lines. But this is not the time to hold back for fear of being exposed to ridicule or unwarranted accusations.

My first specific suggestion is that you speak directly and personally to the American people. What you may say to them, and you might wish to speak to them once a month, will be news, and because it will be news, it will be carried by the radio stations in the United States and will be reprinted in the newspapers. Naturally you would want to speak in Russian, but your interpreter could convey your speech sentence by sentence in English. Your speech could be recorded and released simultaneously in Russia and America.

The American people listen to their presidents because what the President says to them may affect their lives, and they will listen to you for exactly the same reason. But there is one important difference; you will be speaking to them as the head of a foreign state; your speech will be without effect with them unless it is felt to be one hundred percent sincere. The sincerity of your expression, as well as the other tokens of sincerity which you may be able to present to the American people, will determine whether your speeches will strike home.

If your speeches to the American people were given full publicity in Russia, you would go a long way towards convincing the American people that you mean what you are saying to them.

And you would go a long way towards convincing the American people that they may expect fair play from you if you invited the President of the United States to address the Russian people just as often as you speak to the American public and accorded just as much publicity to his speeches in Russia as is given to yours in America.

All the machinery through which the American public is being kept informed in the United States would be at your disposal, and it would remain at your disposal in the absence of any attempt to use it for purposes of propaganda.

That you would be heard by the American people is certain; but how your speeches would affect them would depend both upon the substance and the tenor of these speeches.

What indeed should be the substance of your speeches?

What I suggest, in the first place, is that in your speeches you present to the American people a clear picture of a general settlement within the framework of a post-war reconstruction of the world, a settlement that would enable Russia and the United States to live in peace with each other.

At first you will be able to give such a picture in rough outline only; gradually you may be able to fill in more and more of the details. You might convey the details, perhaps, by issuing from time to time supplementary official reports.

By the time you have filled in the details, you will have given the American people more than merely a picture of a possible post-war world; you will have presented them with something that will amount to an offer for a post-war settlement.

You might well ask at this point, because it is indeed a crucial question, whether such a unilateral offer on your part, if it is generous, would not put you at a disadvantage from the point of view of later negotiations. You could easily make it clear, however, that your offer has to be taken as a whole, that you are perfectly willing to modify any one sin-

gle point to meet the wishes of the United States Government, but that for every point that the United States wants to have modified in her favor, you may ask that some other point be modified in Russia's favor. As long as this is clearly understood, you need not, and should not, hold back for the sake of later bargaining.

Such are the means through which you may be able to convince the American people that—in your view as well as in fact—private enterprise and the Russian economic system and also mixed forms of economic organization can flourish side by side; that Russia and the United States can be part of the same world; that "one world" need not necessarily be a uniform world. Until such time as the American people as well as the Russian people shall be convinced of this all-important point, we shall remain headed towards war and not towards peace.

I am told that these days the opposite thesis is presented by authoritative writers in Russia. And if this opposite thesis should be accepted as correct in America as well as in Russia—if it should be generally believed that there is indeed some inexorable law which, in the long run, makes war between your country and ours inevitable, then those in the United States who are now working for the preservation of peace would begin to feel that they are merely delaying the war which will be all the more terrible the later it comes.

THE RESPONSE EXPECTED

Naturally you would want to know how the American people would respond if you should decide to take the initiative and adopt a new line of approach towards the United States. Would you really be able to break the present deadlock and thereby bring about a change in the course of United States foreign policy?

There is a vast body of men and women in the United States who view with genuine concern the rapid deterioration of Russian-American relations. Many of them have grave doubts in their heart as to the general wisdom of the present course of United States foreign policy, while they regard with equal misgivings the Russian counterpart of this policy. If they do not at present take a stand in favor of changing the course steered by their own government, it is first of all because they do not see with sufficient clarity any practicable alternative course under present circumstances. Moreover they may believe that any attempt to bring about a change must necessarily come to naught as long as the speeches of your delegates will continue to follow a line of reasoning which is unacceptable to the large majority of the American public.

If you succeed in the difficult task of formulating in your own mind a practicable solution of the post-war issues and in conveying your picture of such a solution to the American public, then gradually, as you make statement after statement and issue report after report, a complete picture of an acceptable post-war settlement may unfold before the American people. By the time you will have filled in the details, and thus have implicitly extended a comprehensive offer, you also will have removed the block which had caused the deadlock.

This should have a direct and immediate effect on the foreign policy of the United States. Most Americans believe that those who are at present in charge of guiding American foreign policy were driven to the present policy because none other appeared practicable to them in the circumstances. It is generally believed that they are men of good will, who can be expected to change the present course the very moment they see a satisfactory way out of the present impasse.

You may or may not concur with this opinion. But in any case it is clearly within your power to give the American people a choice between two alternative courses of foreign policy. And if they do have a choice, the American people will exercise their choice—this I fervently hope—in favor of a course which may lead to peace. They will exercise their choice through all the mechanisms by which public opinion influences government policies in America. And those who are at present in charge of steering the course of American foreign policy may, to borrow a phrase of Mr. Stimson's, "either change their minds or lose their jobs."

In this "Letter" I am trying to cope with a difficulty of communications which might be insurmountable. We in America have a crude and oversimplified picture of how political decisions come about in Russia. You in Russia may have a similar picture concerning America. It might be therefore difficult for a Russian to go along with the basic assumption of this "Letter", that in America the most important factor for political decisions is not a public opinion created by the press but rather the attitudes and opinions of the individuals who constitute the American public, and that these attitudes and opinions may become the controlling factor in certain circumstances. But if this "Letter" had not one chance in a thousand of receiving serious consideration in Russia, I still would want to write it rather than to face the charge of seeing the approaching catastrophe without even raising a hand trying to avert it.

If the conclusion were reached that the measures advocated in this "Letter" would be effective, if adequately implemented, it would become necessary to face the difficulties of implementation. The difficulties of formulating an adequate solution to the post-war issues which would be acceptable to both Russia and the United States, as well as the rest of the world, are greatly increased by the absence of any interchange of thought between Americans and Russians who are not encumbered by the responsibility of representing the views of their Governments. It is perhaps understandable that atomic scientists should particularly stress this point and that they should discuss with each other whether there is any proper way in which they could help to bring about such an interchange of thought. The difficulties which stand in the way of achieving this or even a reasonable substitute thereof are obvious. But in view of their special responsibility it is perhaps not unnatural that atomic scientists should wish to assist in the implementation of some significant endeavor aimed at the permanent establishment of peace.

The general sentiment underlying this "Letter" is, I know, shared by the majority of the atomic scientists who take an active interest in matters of public policy, but the specific thoughts embodied in this "Letter" and the decision of writing it are my own and I am not speaking for any other person or persons.

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WORKING FOR A MIRACLE

On superficial reading, and given the present trend of public opinion, Mr. Szilard's "Letter to Stalin" may bring to the author and, by implication, to the atomic scientists, an accusation of pro-Soviet leaning, or at least, of great naiveté in respect to political realities in general, and the Soviet system in particular.

Those who have followed the educational and political activities of the atomic scientists, know that the reason why a majority of them feel keenly the necessity of a comprehensive settlement with the Soviet Union and are skeptical about the long-range value of a policy of "containment" is not ideological sympathy or political nearsightedness, but the sober reflection that in the age of atomic and bacteriological warfare, no "containment" can be a lasting guarantee of the incapacity of a nation with the dimensions and industrial and scientific potential of the Soviet Union, to challenge the rest of the world. They know that if we were permitted to drift into such a conflict, the Soviet Union, despite a vastly inferior industrial power, would have the advantages of lesser vulnerability, easier dispersal, better psychological preparation for total war and habitual regimentation of national life.

Starting from these premises and refusing to consider a "preventive" war as a morally justifiable alternative to a more dangerous war later, Mr. Szilard is looking desperately for a way out of the deadlock. In a letter reprinted on this page, he describes the reasoning by which he concluded that one such way might be to induce the Soviet leader to approach the American people directly. Mr. Szilard sees the American people and the Soviet leadership as the main forces on the world scene; if these two make up their minds that war is inevitable, nothing will be able to prevent it, since the Russian people has no voice of its own, and the American government is only an agent of the people.

Obviously, this concept is quite different from the Soviet "line", which blames the trend toward war on "warmongering" by a capitalist-dominated government and press.

How much chance there is of the Soviet leaders heeding Mr. Szilard's advice, or of using the proffered channels of communication for something other than their usual pronouncements? Mr. Szilard acknowledges that this chance is very small. Why, then, does he deliberately expose himself to accusations of political naiveté?

As witnessed by his memorandum of 1945 (reprinted in this issue), Mr. Szilard early recognized that the atomic bomb would make the maintenance of an "armed peace" very difficult, if not impossible, and that only the "miracle" of a comprehensive settlement (Mr. Fermi has defined a miracle as an event which has only a 10% chance of happening) can prevent a war between the two remaining major powers.

Recent developments give little reason to dismiss Mr. Szilard as a foolish prophet. He apparently thinks—and he may be right—that by now, the chances of preserving the peace have become so small, that *every* approach which may conceivably break the deadlock, is worth trying. Not being content like many others, with waiting for a miracle, he feels that he must do something to bring it about.

Many will think that the kind of miracle Mr. Szilard is trying to conjure up is the least likely to materialize; it is up to them to analyze what "miracles" have a better chance of happening, and go to work to increase their probability.

E. R.

COMMENT TO THE EDITORS BY DR. SZILARD

November 13, 1947

Dear Sirs:

Since the permission requested in my letter to the Attorney General of October 25 was not granted, I did not ask for further postponement of the publication of the article entitled "Letter to Stalin." I had discussed this article with quite a number of persons outside the atomic scientists' movement, and perhaps some of the questions raised, and the objections made, deserve to be recorded here.

One objection took the stereotyped form of "Why do you address yourself to Stalin? Why don't you write to President Truman?" Curiously enough, this very same phrase was used by two groups of persons—those whose outlook is close to that of the Administration and those on the left who oppose the foreign policy of the Administration. While these two groups use the same phrase, they do not, of course, mean the same thing at all.

"Those on the left" mean that by writing such a "Letter" I am acknowledging that Stalin is the real obstacle to peace and I am neglecting to mention that actions on the part of our own Administration have contributed to, or have been largely responsible for, the present disturbing situation.

Those sharing the Administration's point of view seem to feel that, by addressing myself to Stalin, I am acknowledging that Stalin has a greater desire for peace, or has a greater ability to recognize the right path to peace, or else has a greater power to bring about a change than President Truman or his administration. These men will also say to me that those who are in charge of guiding American foreign policy are men of great ability who have an intense desire for peace. And if I accept this view as correct—they say to me—then I ought to propose to Stalin (if I must propose anything to him at all) that he make a comprehensive offer to the Administration, rather than that he address himself to the American people.

My answer to them is, of course, that their view of our policy-makers—which incidentally is shared by the majority of the American people, as stated in my "Letter"—is irrelevant, for Mr. Stalin will base his actions *on his own views* rather than on ours. In my "Letter" I have, therefore, suggested a course of action which Mr. Stalin can follow even though his view may differ from ours. I suggested that if and when he has a case—and at present there is no case before us—he can take it to the highest authority in America—the American people.

Why did I not write to President Truman? First of all, because I cannot say to the President that if he

(Continued on Page 353)

ATOMIC BOMBS AND THE POSTWAR POSITION OF THE UNITED STATES IN THE WORLD — 1945

The following are excerpts from a memorandum prepared by Dr. Leo Szilard in March, 1945. This memorandum was to be placed before President Roosevelt, but owing to his sudden death, it did not reach him. Referred by the White House to James F. Byrnes it was placed before him by the author in a personal interview on May 28, 1945 (six weeks before the first bomb was tested in New Mexico). These excerpts contain none of the secret information which was embodied in the original document. It is believed that this was the first document which discussed the implications of the atomic bomb with respect to our future relations with Russia and the question of international control of atomic energy. It also contained the original suggestion of denaturing fissionable materials for the purpose of making more difficult their use for the manufacture of bombs.

The development of the atomic bomb is mostly considered from the point of view of its possible use in the present war and such bombs are likely to be available in time to be used before the war ends. However, their role in the . . . years which will follow can be expected to be far more important and it seems that the position of the United States in the world may be adversely affected by their existence. The following might very well turn out to be the future course of events:

Before the end of the war we shall use atomic bombs against Japan. These bombs will be much less powerful than we know could be made and which in all likelihood will be made within . . . years yet the first bomb that is detonated over Japan will be spectacular enough to start a race in atomic armaments between us and other nations.

In a few months Russia's war with Germany may be over. The work on uranium will then undoubtedly be given a high priority there but it will perhaps still not be carried out on a large industrial scale until we detonate our first atomic bomb and thus demonstrate the success of this development. For a few years after that we shall almost certainly be ahead of Russia. But even if we assume that we could keep ahead of her in this development all the time, this may neither offer us protection from attack nor necessarily give us substantial advantage in case of war . . . years from now.

. . . years from now Russia may have accumulated enough of some of the active elements which may be used for constructing atomic bombs to have an equivalent to...

Clearly, if such bombs are available, it is not necessary to bomb our cities from the air in order to destroy them. All that is necessary is to place a comparatively small number of such bombs in each of our major cities and to detonate them at some later time.

The United States has a very long coast-line which will make it possible to smuggle in such bombs in peacetime and to carry them by truck into our cities. The long coast-line, the structure of our society, and our very heterogeneous population may make an effective control of such "traffic" virtually impossible. One can easily visualize how a "friendly" power in time of peace may have such bombs placed in all of our major cities under the guidance of agents. This might be done free from aggressive intent. Such a power might know or suspect that we have accumulated a quantity of atomic bombs and fear our defenses are so strong that after the outbreak of hostilities it would be difficult to reach our cities by air. In such circumstances it may be exceedingly difficult for its "government" to refuse to take "precautions" which its "army" considers necessary. . . .

So far it has not been possible to devise any methods which would enable us to detect hidden atomic bombs buried in the ground or otherwise efficiently protected against detection.

If there should be great progress in the development of rockets after this war, it is conceivable that it will become possible to drop atomic bombs on the cities of the United States from very great distances by means of rockets.

The weakness of the position of the United States will largely be due to the very high concentration of its manufacturing capacity and of its population in cities. Thirty million people live here in cities of over 250,000. This concentration is so pronounced that the destruction of the cities may easily mean the end of our ability to resist. Keeping constantly ahead of the Russians in our production of these heavy elements will not restore us to a strong position. No quantity of these "active" materials which we may accumulate will protect us from attack and so far as retaliation is concerned, we might not be able to do more than to destroy the large cities of Russia which are few in number and the economic importance of which is in no way comparable to the economic importance of our own cities. Thus it would appear that we would not gain an overwhelmingly strong position in a war with Russia merely by accumulating an enormous quantity of these elements or by increasing, as we might, the efficiency of our bombs from...to a much higher value.

The strong position of the United States in the world in the past thirty years was essentially due to the fact that the United States could outproduce every other country in heavy armaments. It takes a very large number of tanks, airplanes and guns to bring about a decision in a war and as long as tanks, airplanes and

guns are the major instruments of war the large production capacity of the United States gives it an advantage which may be considered decisive.

The existence of atomic bombs means the end of the strong position of the United States in this respect. From now on the destructive power which can be accumulated by other countries as well as the United States can easily reach the level at which all the cities of the "enemy" can be destroyed in one single sudden attack. The expenditure in money and material which is necessary to reach this level is so small that any of the major powers can easily afford it provided . . . For us to accumulate active materials in quantities beyond that necessary to destroy the cities of the "enemy" would probably give us some advantage in the war, but it is difficult to say whether the importance of such "excess" amounts of material would be really substantial. Out-producing the "enemy" might therefore not necessarily increase our strength very much.

The greatest danger arising out of a competition between the United States and Russia, which would lead to a rapid accumulation of vast quantities of atomic bombs in both countries, consists in the possibility of the outbreak of a preventive war. Such a war might be the outcome of the fear that the other country might strike first and no amount of good will on the part of both nations might be sufficient to prevent the outbreak of a war if such an explosive situation were allowed to develop.

One of the questions that has to be considered is whether it might be possible to set up some system of controls of the production of these active materials. Such controls would ultimately have to extend to every territory on the earth. Whether it is politically and technically feasible to set up effective controls and what we could do to improve our chances in this respect are questions that urgently require study and decisions. Some further remarks on these questions are made below, but other considerations might be put forward as soon as the question receives the attention of the Government.

A system of controls could be considered successful only if we could count on a period of grace in case the controls were denounced or obstructed by one of the major powers. This means that the system would have to be of such a nature that at least . . . would lapse between the time the nations began to convert their installations for the purpose of manufacturing atomic bombs and the time such bombs became available in quantity. . . .

SYSTEMS OF CONTROL OUGHT TO BE CONSIDERED

From a formal point of view all countries may be considered as potential enemies, but it is perhaps not too optimistic to assume that we may disregard the possibility of a war with Great Britain in the next fifteen years. It appears, however, rather unlikely that jointly with Great Britain we could police the world and thus prevent by force the manufacture of all of the "active materials" anywhere in the world, including Russia.

It might perhaps be possible to set up jointly with Great Britain and Russia some sort of joint control of the manufacture of the active materials everywhere in the world if we could get Russia to agree to such a control which of necessity would have to extend to her territory. The purpose of such a control would be to prevent the active elements from becoming available in a form in which they could be used for the manufacture of atomic bombs. This would not necessarily mean that the development of atomic power has to be suppressed but only that the elements involved must not be prepared in certain forms and degree of purity.

This point raises the following question: What forms of atomic power can we permit to be organized if we want to make sure that the available materials and facilities cannot easily be converted for the manufacture of atomic bombs? Some thought has already been given to this question with the following result.

There are two types of active materials. Materials of the first type can be diluted by the abundant isotope of uranium in such a way as to rule out the possibility of using them for atomic bombs while leaving unimpaired the usefulness of the materials for industrial purposes. A chemical separation from the diluting material would be impossible and a conversion into materials which can be used for atomic bombs would take . . . .

Material of the second type which can be used for atomic bombs can be "denatured" by . . . . Whether more elaborate methods can be worked out which will permit the detonation of the denatured material is a question which would have to be carefully scrutinized. These lines merely serve to indicate that there might perhaps be a satisfactory solution to the problem of reconciling the requirements of safety of the United States with the desire not to hamper the development of atomic power for industrial purposes.

Unfortunately it is by no means sure that a satisfactory solution of this problem is in fact possible. It would be much easier, safer, and would require a much less tight control to arrest the development of atomic power by scrapping and outlawing the large and easily visible installations which characterize the first stage of this development.

CONTROL OF RAW MATERIALS COULD BE CONSIDERED

If Russia, the United States and other countries were willing to forego the use of atomic power for peacetime purposes, one could have a system of control that would be fairly simple since it would be almost sufficient to control the movements of raw materials. Ores of uranium would have to be mined under control and transported to some "neutral" territory. Whether or not it would be permitted to have in a neutral territory installations belonging to . . . and atomic power plants is a question of minor importance. It appears likely that if the major powers were willing to forego the use of atomic power, a system of controls could be set up without encountering too great difficulties.

AN ALTERNATIVE SYSTEM OF CONTROLS WOULD HAVE TO BE MUCH TIGHTER

On the other hand, if the United States, Russia, and other countries should have atomic power installations within their own territory, a very tight system of control would be needed in order to make sure that the nations would not have to face a sudden attack by atomic bombs. For a control of this sort to be effective, it would be necessary that our agents and the agents of Great Britain move

freely around in Russia, be permitted to keep contacts with Russian civilians, secretly employ Russian civilians for the purpose of obtaining information, and have entry into every factory or shop throughout the vast territory of Russia.

That there may be dangerous loopholes in control systems which might be set up is illustrated by events that took place in Germany after the first World War. At that time, there were many Germans who were willing to give information to the Inter-Allied Commission about violations of the control regulations, but those who actually did so were publicly tried under the German Espionage Law and were given heavy sentences. The Treaty of Versailles did not stipulate that the German Espionage Law must be revoked.

Clearly, it would be desirable to create a situation which would permit us to appeal in various ways to physicists and engineers everywhere for information that would uncover violations of the controls. This would give us additional assurance that such violations would be detected but it presupposes that we succeed in creating conditions in which we would guarantee the personal safety of those who volunteer such information and the safety of their families.

Since Russia cannot be expected to agree to such a control unless she obtains the same rights of control in the United States and Great Britain the question whether Congress and the people of the United States are willing to agree to such a control might become of paramount importance.

HOW COULD RUSSIA BEST BE PERSUADED?

As to our chances of persuading the Russians to accept mutual control, much may depend on the proper timing of our approach to Russia. It would appear that such an approach would have to be made immediately after we demonstrated the potency of atomic bombs....

Events may be expected to move so fast that if it is intended to reach an agreement with Russia and other countries such an agreement would have to be complete before the next presidential elections....

IF THE CONTROL IS INTERFERED WITH

While it may be a great step forward to establish a tight control on the atomic power development by a reciprocal agreement with Great Britain and Russia and extend it to all territories of the world, yet we cannot disregard the possibility that one of the major powers, for instance Russia, after a few years—during which the controls may have operated quite successfully—may begin to place difficulties in the way of an effective control of activities conducted on its own territory. It would be quite essential that the people of this country and the world be brought to understand from the start that any difficulties which any nation may place in the way of the established controls would have to be considered as tantamount to a "declaration of war".

Such a "declaration of war" would have the effect that the United States and other countries involved would at once begin to manufacture atomic bombs. If up to that time the control had been effective, it would take... to convert the materials and installations involved in the utilization of atomic power to the manufacture of bombs. In such an "armament race" in which all countries would have to start, so to speak, from scratch, the position of the United States might be quite favorable, provided the development of atomic power had been kept up at a high level.

Clearly if any major power deliberately wants to start a war, there will be a war and all that we can hope to achieve by the reciprocal control which we have discussed is that a war may not break out as a result of an armament race.

Still, it would seem that if the situation were generally understood there might be some hope that having succeeded in setting up a system of reciprocal control and having kept it in operation for a few years, neither the United States nor Great Britain nor Russia would attempt to interfere with this system of control in such a manner that its acts would be considered by the other partners as a menace. We would then perhaps have a chance of living through this century without having our cities destroyed.

An attempt to manufacture atomic bombs undertaken by any of the smaller countries would be of minor importance since it could be met by immediate armed intervension using ordinary methods of warfare such as tanks and airplanes.

IN THE ABSENCE OF A SYSTEM OF CONTROLS

In discussing our postwar situation the greatest attention was given in this memorandum to the role that Russia might play. This was not done because it was assumed that Russia may have aggressive intentions but rather because it was assumed that if an agreement can be reached with Russia, it will be possible to extend the system of controls to every country in the world....

Dr. Szilard's Comment

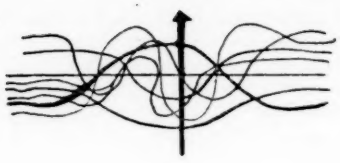
(Continued from Page 350)

made a comprehensive offer for settlement of the post-war issues the Russian government would respond favorably. I cannot possibly have any basis for knowing how the Russian government would respond to any such approach. On the other hand, I *can* say how I believe the American people would respond to such a new approach on the part of the Russian government.

Moreover, while I would not wish to say that the conduct of our own foreign policy could in no way be improved upon under present circumstances, I do not believe that the problem which faces the world today can be solved at the level of foreign policy in the narrow sense of the term by the Administration; nor do I believe that it is within the power of the Administration to offer to the world a satisfactory solution of this problem without the full support of the American people for a bold and constructive solution. Since I have developed these thoughts in a previous article—"Calling for a Crusade" which appeared in the April-May issue of the BULLETIN—I need not again go into this point here. But I might perhaps add that today it no longer seems likely that popular support or popular pressure for a bold and constructive solution will be forthcoming unless the people would have reason to believe that they could expect the Russian government to be cooperative.

Leo Szilard

ALSOS: THE STORY OF GERMAN SCIENCE



Philip Morrison

Dr. Morrison reviews for the BULLETIN **Alsos**, *Dr. Goudsmit's story of German scientific effort recently published by Henry Schuman and Co. Dr. Morrison, who is now Professor of Physics at Cornell University, followed closely the attempts to find out how far and how fast German wartime science was progressing, and was a member of the first United States mission to visit Japan after the bomb fell.*

The Pentagon was a strange place in the months just before D-day. The enormous staff and detailed planning which makes up the base of every modern campaign had for the most part been finished. The experts had begun to learn a new geography; the National Geographic maps on every office wall showed the Japan Sea more often than the coast of Fortress Europe. Planning and initiative had passed for the most part to Eisenhower's staff, busy in London. Washington's job was to look ahead. There were a few urgent tasks still to be organized from the foundation up. One of these was Alsos.

ALSOS IS ORGANIZED

The Manhattan District, under General Groves, was anxious to learn how far German work on the atomic bomb had gone. This problem was a rather new one for Military Intelligence. The great secrecy about our own effort and the novel nature of the weapon combined to invalidate many of the traditional schemes of G-2. The bomb, with its top priority and its even higher secrecy, was the last but one of a whole series of technical innovations which made a scientifically-oriented military intelligence necessary. Under the sponsorship of G-2, but with concealed and high pressure from the Manhattan District, a special intelligence mission was organized. This was Alsos.

The word is an excellent example of the letter jargon of the war, and I have heard many readings of it, beginning perhaps "American Liaison Special . . ." But it just means groves, in Greek.

The name epitomizes the story of this mission. It was to examine the whole scientific progress of the enemy, first in the soon-to-be liberated countries west of the Rhine, and finally into Germany itself. Its assignment was a wide one, covering everything from camouflage paint to vaccines, but its heart belonged to uranium. It was from the Manhattan District that its real powers and its eagerness flowed.

The scientific leader of this mission was a happy choice, Professor S. A. Goudsmit, now at Northwestern University. Goudsmit was an early recruit of the Radiation Laboratory at M.I.T., who was pried loose from them only by considerable skillful diplomacy. He is a physicist of wide training, a man fluent in half the languages of Europe both by his birthright as a Hollander and by years of continental study. He knows the physicists of Germany as few men do. It was he who turned the hopeful lists of names and the bad guesses of Washington into real evidence.

PURSUIT OF URANIUM AND TOOTHPASTE

Alsos is Professor Goudsmit's story of the mission. It is only candid to say that the unfortunate demands of continued secrecy, added to a not entirely winning style, make the story of *Alsos* somewhat less good reading than it ought to be, and much less interesting than Goudsmit's skill as raconteur promised. But it is still an exciting story, and its anecdotes not only show how far Nature holds up the mirror to the art of Eric Ambler, but have a genuine historic importance for us. The nature of secrecy in science and the difficult question of the relation between scientists and politics are two points of the widest value which *Alsos* illumines.

The urge to tell at least one story from the book is irresistible. The Washington economic and technical studies of Germany were good enough to guess which German firms were likely to be engaged in any German work on uranium processing. When Paris was freed the early entry of Alsos to the happy city gave the mission plenty of work. A prime "target" was the Paris office of the Auer firm. As we had feared, Auer in Paris had indeed collected uranium. More than that, the Paris representative had scraped the French supplies of thorium for every kilo in the land. Was the U 233 possibility worked on by the Germans? Were we missing something important?

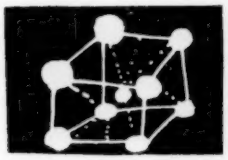
Alsos would find out. The Auer office was bare. But with real elan and much hard jeep-riding and some luck, the Auer man from Paris was found hiding out in a little Belgian town newly fallen into Allied hands. The trail had been followed in the best tradition; cherchez la femme! Peterson was quizzed. He had bought thorium, he didn't know why. He had been in Hechingen not long past to "visit his mother".

But Alsos knew that Hechingen was the evacuation village in south Germany for the Kaiser Wilhelm Institute for Physics. Herr Petersen couldn't be cracked. It is still hard to believe, but the reason which actually led Auer to stock thorium turned out to be the crack-brained scheme of an Auer director for making *thoriated toothpaste* in the happy post-war world! The reader of *Alsos* will find more than one such marvelous yarn.

There are more serious things to be found in the book. One is impressed

(Continued on Page 365)

ATOMIC SCIENTISTS HAVE TWO RESPONSIBILITIES



Edward Teller

From his own conscientious consideration of problems raised by the development of atomic energy Dr. Teller recommends two courses of action to his colleagues. Dr. Teller came to the Metallurgical Laboratory in Chicago in 1942, later went to Los Alamos, and is now Professor of Physics and member of the Institute for Nuclear Studies at the University of Chicago.

The original program of the Atomic Scientists consisted of two important issues: one domestic; the other international. The domestic issue was to place the direction of atomic development into the hands of a civilian agency and to enact legislation which secures to our people the maximum benefits of the new discoveries, and which does not place unnecessary restrictions on the scientist working on atomic energy.

The international issue was to get agreement and cooperation between all nations so that the people of the whole world could work together in this new and wonderful field of human endeavor. This was the positive side of the international issue—but there was also a negative side, which in the minds of all of us outweighed all other questions. How shall we avoid a war in which atomic weapons and perhaps other scientific inventions would be used?

DOMESTIC SUCCESS: INTERNATIONAL FAILURE

The domestic issue has been settled to the complete satisfaction of the scientists. Atomic energy legislation has been enacted after considering carefully what every informed person had to say.

The result is a triumph of democratic procedure. Within a year after the fateful date of Hiroshima, our legislators had familiarized themselves with the new and perplexing field of atomic energy and a law was written which is wisely designed to encourage and coordinate scientific and technical progress. To administer this law a commission was chosen consisting of capable and well informed men. These men are fully aware of the nature of scientific work and are more than willing to create conditions under which scientific and technical personnel can work with success.

Initial progress on the international question was no less promising. The Acheson-Lilienthal committee worked out a hopeful and imaginative plan for international cooperation in the atomic field. This plan was to a considerable extent inspired by the best of our atomic scientists and was fully supported by the organization of the Atomic Scientists. The proposal demanded from the government of our country considerable sacrifices. We were to give up at an early date our monopoly of the atomic bomb. In addition, we were to relinquish a considerable part of our national sovereignty.

Our representative, Mr. Baruch, put this plan before the United Nations as the official United States proposal. This was done for the good of mankind; it was done with the clear understanding that what is best for humanity as a whole is also best for the people of the United States. The majority of the United Nations adopted the Acheson-Baruch-Lilienthal proposal as the basis of further discussion. Yet the plan is now a complete failure. It failed when the men of the Kremlin rejected its essential provisions of joint development and international management.

The domestic success and the international failure places two heavy responsibilities on the Atomic Scientists.

Our responsibility at home is to work for the successful and rapid development of atomic energy. In this development we must include all phases: The scientific exploitation of intensive neutron sources for the advancement of nuclear physics, the use of radioactive tracers in biology and medicine, the development of equipment to transform atomic energy into useful work, and the exploration of that terrifying problem, the atomic bomb.

CONTINUED WORK IS OUR RESPONSIBILITY

That scientific work should be pursued, none of us doubt. Most will agree that technical progress must continue. Our specific knowledge of atomic energy, the blessings of our wealth, and the opportunities of this democratic country place on us the responsibility to make atomic energy a useful servant to man at the earliest possible time. Our country possesses big coal mines and plentiful oil wells. Many of our rivers help to provide us with energy.

We do not need atomic energy as badly as many of our less fortunate neighbors. But the scientists, as well as the majority of the people of this country, know that we must serve humanity as a whole if we want to survive. We fought two wars for reasons other than personal gain. We are now prepared to spend a considerable part of our wealth to help in the reconstruction of Europe. The scientists can do their share by constructing the machines which will help to develop industries in South America, India, and China.

There will be more doubt concerning the atomic bomb. Has man not yet found a good enough way to destroy his brother? There can be but one answer to this question. It is our bitter misfortune that this question and this answer do not solve any of our problems.

The men of the Kremlin showed by their actions that in the world to come military power will be of the greatest importance. It is the duty of those of us who made the first atomic bombs to find out all the dangers and all the terrors of our discovery. We have eaten of the tree of knowledge, and as scientists we must have the faith—perhaps the temerity—to believe that knowledge in the end will be turned into blessing. At least we should have the conviction that if we should give way to fear and if we should fail to explore the limits of human power we shall surely be lost.

To me there is one compelling reason for a whole-hearted effort in all the fields of atomic energy. Progress in this democratic country under the present liberal Atomic Energy Administration is the only chance to realize our ideals of peace and plenty for all. Not to believe in this is defeatism and will bear the fruits of defeatism.

OBLIGATION OF INTERNATIONAL FAILURE

No one can discuss our domestic plans for atomic development without bearing in mind the grim realities of the international situation. I have not tried to separate these inseparable issues. But now I should like to say a few more specific things about our failure to reach an international understanding. Have the scientists discharged their duty by helping to formulate the Baruch-Acheson-Lilienthal plan? May we now turn our backs on this apparently insoluble problem?

I do not believe so. I also do not believe that we should accept as a solution anything less than was originally proposed by the United States. The safeguards of peace were slim enough in the Baruch plan. We could, nevertheless, have hoped for success if everybody had entered into the proposed agreement in the spirit of sincere cooperation. This has not happened, and no bargaining will now make the Baruch plan the living reality that it might have been.

In the present difficult situation I think it is the duty of every man to be an optimist. I shall add a definition: an optimist is a person who believes in the survival of the human race.

Above I have stated that the stand of the Russians has blocked any progress based on the Baruch plan. I should now like to add that to me, agreement with the Russians still seems possible. Russia is now acting as an extremely nationalistic country. What they are now practicing, is imperialism, pure and simple. I see no reasonable way to justify their stand, but there is also no compelling reason to believe that this disastrous Russian policy will remain unchanged in the coming years.

There have been other nations which have left the road of imperialism and unbridled national ambition and which are now fit and ready to be the cornerstones of a peaceful and cooperative world. It is a constant surprise to me that—if I can believe history—this description fits the nation of the Danes to perfection.

If, however, we are to arrive at a stable world order, we must not propose less than the Baruch plan. We must propose more. We must work for world law and world government.

How this is to be done is a question of extreme importance—a question to which the answer must depend to a considerable extent on day-to-day politics. But our aim, it seems to me, ought to be clear. I have tried to clarify in my own mind what this aim should be.

We need a world government which makes war between the participating nations technically impossible. Thus the world government must be an indissoluble military union.

There is an economic requirement no less important than the military. We must accept responsibility for the well being of all the participating nations. It is clearly impossible to lift the standard of living in China to the American level in the next twenty years. But we must set the American standard of living as a goal for the whole world, and we must make a substantial down payment on this plan.

We must refute by clear deeds those who would call us the exploiters of the world, and we must show that prosperity in this country will be used to aid any one who is willing to accept our help and friendship.

The military and economic conditions must be finally rounded out by a political requirement. There can be no world government unless such a government has the power to protect personal liberty and freedom of speech throughout its domain. If we do not insist on such a "Bill of Rights" nothing can prevent a local dictator from setting up a state within The State and the purpose of the world government soon would be thwarted.

Many will argue that Russia will not accept such conditions. However, the realization of such a plan over a considerable part of the globe will create a new situation and it is difficult to predict how the masters of Russia will react to it. They have changed their policy in the past. They will change it in the future if we give them good and strong reasons to do so. Even if Russia should not join immediately, a successful, powerful, and patient world government may secure their cooperation in the long run.

I often feel that most people around me are beset by fear and confusion. I am not immune to these ills. Yet, in the following simple statements I firmly believe.

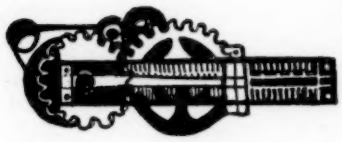
The development of pure and applied science cannot and must not be stopped.

The events of the last years have made it clear that world government will in fact be established either by agreement or after further bloodshed. The dignity of man and the freedom of science, which is the basis of our life and our work, can be maintained only under a democratic government.

"The world cannot remain half slave and half free" must be our guiding principle, regardless of political expediency or of practical difficulties.

We have two clear-cut duties: to work on atomic energy under our present administration and to work for a world government which alone can give us freedom and peace. It seems difficult to take on these responsibilities. To take on less, I believe, is impossible.

TOWARD A NATIONAL SCIENCE POLICY?



This analysis of the conflict between two points of view reflected in recent attempts to pass a National Science Foundation Bill was prepared by a Study Group of the Washington Association of Scientists, Washington, D. C. It was based upon developments up to and including the Presidential veto and the Steelman report. The Study Group included C. Grobstein, chairman, J. M. Conly, I. Feister, L. B. Heilprin, H. Olken, F. J. Pratt, J. W. Rowen, I. Schocken, G. R. Silbiger, R. D. Steiehler, F. J. Weiss, and L. A. Wood. For permission to reprint this analysis the BULLETIN is indebted to the editors of SCIENCE in which the memorandum first appeared.

After two years in gestation a National Science Foundation Bill emerged from the 80th Congress, only to be vetoed by the President. This outcome is undoubtedly puzzling to those who have followed the course of the legislation and are aware of the almost unanimous support for the establishment of a strong national science policy. The paradox exists, however, only when viewed from a distance. Close analysis of the bills introduced into the 79th and 80th Congresses, of the Congressional hearings and debates on these bills, and of the President's veto message and the relevant sections of the recent reports of John R. Steelman,[1] special assistant to the President, and Attorney General Clark[2] shows a sharp cleavage between two opposed philosophies of the relation of science to government and society. From the introduction in the 79th Congress of the original Kilgore and Magnuson Bills, which were based on two sharply divergent conceptions of the nature and purposes of the proposed Foundation, down to the Presidential veto of S. 526, the fundamental dichotomy has persisted and prevented successful completion of the legislation.

In the most general terms, the conflicting philosophies appear to be these. That of the original Kilgore Bill, concurred in by the President and his advisers as well as by many scientists, is based on the premise that science is a national resource, that its raw material is the Nation's scientific manpower, and that, as a vital national resource, its furtherance should be entrusted to an authority directly responsible to the elected representatives of the people—the Congress and the President. The proponents of this philosophy place primary emphasis upon long-range planning for the whole field of science to ensure the development of scientific potential on the widest possible basis throughout the country. They seek guarantees which will deny to special interests a disproportionate influence in formulation of Foundation policy, or disproportionate benefits from its activities. They insist upon a patent policy which will permit free public access to discoveries made with public funds.

The opposing philosophy, embodied in the original Magnuson Bill and, in even more extreme form, in the recently vetoed Smith Bill, regards science as an auxiliary to the development of industry, medicine, and the national defense; it places complete confidence in the existing organizations and facilities for research and believes that these organizations should further the development of science with a minimum of control by the elected representatives of the people. It would thus simply expand scientific activity in the country by enlarging the existing structure, concentrating support in well-tested organizations and centers if results may be thus more effectively attained. It would place control of the Foundation in the hands of recognized leaders in science, industry, and national defense, insulating it from the people's representatives in the interests of security and immediate efficiency.

1. *Science and public policy.* Vol. 1: *A program for the nation.* (A report to the President by John R. Steelman, chairman, The President's Scientific Research Board, August 27, 1947.)
2. *Investigation of government patent practices and policies.* Vol. 1: *Final report proper.* (Report and recommendations of the Attorney General to the President.)

AREAS OF CONFLICT AND AGREEMENT

It is clear that these differences between the two opposed points of view are fundamental and underlie the swirl of controversy which has gone on about more specific issues, e.g. form of administration, inclusion of social sciences, geographic distribution, etc. The basic issue is none other than the proper role of the Federal Government in regulating those areas of our national life which are intimately related to the public welfare and security, in this instance the shape and scope of science. It is not surprising, therefore, to find that groups, organizations, and individuals have lined up on the National Science Foundation very much as they have on atomic energy, national health insurance, Federal support of housing, and similar issues. Science, with its present budget of approximately $1,000,000,000 and a recommended budget (Steelman report) of 1 per cent of the national income, can apparently no longer remain out of the political arena. Issues of fundamental national policy are involved, issues important enough to produce an impasse between the executive and legislative branches of the Government, as expressed in the recent Presidential veto.

In actual fact, the area of agreement between the contending philosophies is limited to the most general features of the legislation. Nearly all

first time peace is possible. Now also it is essential to our very survival.

Until the last few decades, universal government could not have been effective. The channels of speedy communication upon which a central authority must depend for the promulgation of its laws, until recently, were not available to us. Now science has provided us with these tools. Science has also given us the means of mass annihilation. We have the means to create world government and the ability to exterminate our species. Within the immediate future we must decide which road to follow.

PARLIAMENTARY COMMITTEE DECIDES ON ONE PLAN

In January 1946, a group of Members of Parliament met to consider these problems. We were all "backbenchers." Insignificant people, not in government at all. We felt it was our duty to tackle the problem for we then realized two things. First, that we had to get world government quickly if the next war was to be averted. Second, we became convinced that our statesmen could no longer negotiate world government for us.

From about January 1946 international suspicion and tension were becoming so great that there was no longer the slightest chance of the necessary amendments to the United Nations Charter taking place. Far from it, instead of the nations getting together to improve the situation, they were growing apart. There was less and less prospect of the fundamental alterations in the structure of the United Nations without which it was impossible to maintain peace. From that time on, any governmental proposal for alterations in the Charter would be regarded as merely another move in power politics, with other governments opposing or abstaining from support.

Having faced this situation, we realized some other approach had to be found to the achievement of world government if war was to be averted. It was no longer any use leaving it to our statesmen because they cannot do what has to be done.

Our Parliamentary Group met each Tuesday night to examine this problem. We collected all the plans and proposals we could get together and studied them all. Then one by one we eliminated them because they fell short of the need in one respect or another.

Finally, we were left with but one proposal. One idea! One plan! At first it seemed to be utterly Utopian. It seemed to require so much effort against such awful odds that it did not look possible. Then we looked at it again and it did not seem so Utopian. The more we thought about it the more practical it became. One by one we realized that it was eminently practical, could be carried out and would meet the requirements of the situation exactly.

That plan involves the people themselves taking the next political step to world government which at this stage in history the statesmen—even if they were ready to do so—can no longer take.

We decided to be as precise as we could about the details. According to the plan we outlined, we propose to hold in the fall of 1950 a Peoples' World Constitutional Convention to draft the Charter of World Government. Delegates to this Convention will be unofficially elected in as many countries as possible on the basis of one delegate per million of population. This Convention will draft and approve by majority vote a Constitution for World Government.

RATIFICATION OF POPULAR WISHES

Clearly, before we set up a World Government, we have to see its Charter in writing and examine it in detail before we can approve it. And it must be a composite Charter without the mark of nationality. The finished charter remains merely a scrap of paper until it is ratified by the nations of the world.

Our problem then is to secure ratification. There are two possible procedures. We can present the World Constitution to the United Nations Assembly as a composite amendment to the Charter for adoption by two-thirds of the member nations and still subject, under the Charter, to ratification by two-thirds of the member nations *including all the Great Powers.*

If, however, the United Nations is deadlocked, those who have participated in the Peoples' Convention, have the democratic right to submit the World Constitution directly to their national legislatures for formal ratification. In that case, ratification of the Constitution by 50% of the nations of the world or nations representing 50% of the peoples of the world should suffice to bring the world government into operation. Membership shall be kept open for other nations as soon as they have ratified the World Constitution.

In Britain, we hope to bring to the unofficial polls not less than one quarter of our population. That involves about half the people on the election registers. If we can implicate, in the selection of delegates to the Peoples' Convention, about a quarter of our population, we will have given our people the chance of choosing democratically their own representatives and shown the world the weight of public opinion behind the conception of world government.

If in the United States you also get a quarter of your population to the polls, you need have no doubt as to speedy subsequent ratification. If in a substantial number of other countries a similar proportion of the population is mobilized to participate in the unofficial elections, all governments, including that of the Soviet Union, whether the Russian people have been able to participate in the Convention or not, will know precisely that world government will be organized because the peoples of the world have registered an overwhelming mandate to that effect.

For here is our problem. There is a lot of sentiment for world government. Many people claim to be ready for it but complain that no other country is. The British people are ready, our statesmen say, but are the Americans? In Paris they say the French are ready but the British are not. A recent Gallup poll shows that 68% of the American people say they are ready for world government. Yet nothing happens. We all sit waiting for someone else to move first.

I believe the people are ready and ahead of their statesmen. It is they who are not ready. The solution lies in an action program that enables the peoples of the world to work together and simultaneously toward the achievement of world government.

As far as we can see, the plan we propose *can* be carried out. It will be carried out throughout the world and is of such magnitude that we do not estimate it can be done in less than two and a half years. If we are wrong, and if by some miracle, we can accomplish it sooner, let us do so.

GENEVA — 1950: A PEOPLES' WORLD CONSTITUENT ASSEMBLY

Joseph E. Mayer

Dr. Mayer has taken an active part in discussions of the proposal advanced in the preceding article, and here gives his estimate of its value and chances for success. Dr. Mayer is Professor of Chemistry and Associate Director of the Institute for Nuclear Studies at the University of Chicago.

Mr. Henry Usborne, member of the British Parliament, has been touring the United States recently and speaking on behalf of a movement for world government. He has spoken to the Atomic Scientists at Chicago and also at Oak Ridge. A considerable number of those who have heard him, and who have spoken with him, have become enthusiastic supporters of his plan.

The Usborne Plan, as it has come to be referred to in private conversation, is more properly known as the plan for "A Peoples' World Constituent Assembly" in 1950. Briefly, it is a plan for a peoples' movement, throughout the greater part of the world, to hold a Constitutional Convention in Geneva in the autumn of 1950, and there to draft a world government constitution to be submitted for ratification to the various nations.

At first sight the plan seems hopelessly Utopian. After longer consideration, many have become convinced, that it is eminently practical, and that it is a move worthy of support. It has the particularly attractive feature that it does not conflict with, but rather supplements, most of the other ideas that many have been supporting. It is also a plan which offers a definite and attainable immediate objective: namely, the holding of a popular poll in this country in early 1950.

There is actually very little to be said of the specific nature of the plan in addition to the rough outline already presented. It is proposed to start a popular movement in the countries of the world in which this is possible. The movement, in each country, will attempt to carry out a popular poll in 1950 to elect representatives to a "World Constituent Assembly" to be held in Geneva. It is hoped that in many countries a considerable fraction of the electorate can be induced to vote.

REPRESENTATION AND MINIMUM PROGRAM

Every country, whether or not a large popular vote is taken, will be invited to send one representative per million of its population. From some countries these representatives may be selected and sent by the government, but, in principle at least, they will be regarded as representatives of the people rather than of the government.

The more specific details for the plan in this country could be outlined briefly as follows: A committee, representative of the groups supporting the plan should be set up. This committee must raise money, and carry on the campaign, for the plan. Popular support, and the necessary mechanical aids to carry out the poll, must be arranged.

The committee, in agreement with its sponsors, must define, somewhat in advance, the minimum requirements which it understands a world government must meet. For instance the British group agree upon:

1) A monopoly of armed forces to be used as a world police force—participating States to be disarmed to the level of their internal policing commitments.

2) A monopoly of the processes involved in atomic development and other scientific discoveries capable of mass destruction.

3) The establishment of a World Bank for the purpose of creating a common linked currency which can be utilized in every country of the world and which shall hold funds for the Central Authority in order that it may initiate and finance on a large-scale economic planning such as that operated by the Tennessee Valley Authority.

4) The establishment of a World Food Board, similar to that advocated by Sir John Boyd Orr at Copenhagen.

In the British view these would be the necessary prerequisites of an organization which could call itself a world government.

The committee would also have to induce a certain number of able men to appear on the ballot, and to screen other nominees.

To the obvious question as to whether the representation suggested does not give undue weight to such countries as China and India the answer involves weighing several factors. In the first place this method of representation is proposed only for the Constituent Assembly, and it is not implied that the same system of representation would be carried over into the final Constitution.

The delegates from India and China, who have most to gain, will probably be most willing to compromise on this point in order to attain a Constitution which would be acceptable to the great powers. Secondly it is doubtful if India or China would wish to send and support their full quota of delegates, and each delegate will have one vote regardless of the population he represents. This method of representation in the Constituent Assembly is simple, and therefore practical; a more complicated scheme of representation would hardly seem desirable at this stage.

RELATION OF PLAN TO THE UN

The plan appears to, and does, ignore the United Nations. It is not intended, however, to be inimical to the UN. At present the UN is dead-

locked. The existence of a strong popular movement would strengthen the hand of those in the UN who might wish to carry out the reforms within the UN necessary to strengthen that organization. Were the UN to anticipate the movement by actually holding, before 1950, a convention looking toward a fundamental strengthening of its own constitution, the Usborne movement would, without doubt, collapse from lack of the impelling necessity which nurtures it now. One can also be sure that none would be happier than the supporters of the plan for the Peoples' World Constituent Assembly. However, few will visualize this as a likely occurrence.

A more likely eventuality is that the Constitution drawn up by the PWCA might be introduced into the UN as an amendment to its own constitution. If this does not occur the next step in the plan would call for support of ratification of the Constitution by the governments of the various countries. Presumably the Constitution would become operative when ratified by a certain number of countries.

CHANCES OF RATIFICATION

One great strength of Usborne's proposal appears to be that it avoids working through the existing governments. This has been criticized as a lack of faith in the democracy of our government. To me, at least, this criticism appears to be unjustified. It is a natural method of reform movements to gain popular support by holding, and advertising, a convention or conventions, in which the exact nature of the reform is clearly defined and specified. The fact that this reform, the movement for world government, is world-wide rather than national, requires an international convention. In most reforms, such as women's suffrage, the exact nature of the reform is fairly well defined by the catch words describing it. In the case of world government the situation is different. An exact definition, in terms of a proposed constitution, is necessary before governmental action is possible. To seek such a definition is hardly a rejection of our government!

Any discussion of world progress is too abstract to be appealing if mention of Russia is omitted. The chance of success of any scheme clearly depends not only on its reception in the "capitalist" countries, but also in Russia and its satellites. A "world" government that consists only of those countries now on the American side of the UN fence may be desirable, or necessary, but it is a different thing than a world government embracing all nations.

The probability that one assigns to the chance that Russia and the countries dependent on her will enter the Peoples' World Constituent Assembly depends largely on the extent of one's Russophobic or Russophilic leanings. It may be hoped that the plan will be supported by leaders of left-wing parties in the western continental countries, France and Belgium, for instance. If this support is forthcoming it is doubtful if the Russian government would care to antagonize these forces by actively condemning the movement as "imperialistic" in nature.

It is hoped that a popular movement may be initiated and carried out in Czechoslovakia. Russia would then be likely to send observers, if not participants, to the Assembly. Even if Russia were not willing to ratify the Constitution, it is possible that some Russophilic satellites would. The "world" government, without Russia, would then not have too strongly the character of an aggressive alliance, and an eventual assent of Russia might be hoped for.

The likelihood of events in this order may seem remote. The likelihood of any defined series of events leading to world stability is remote.

Certainly this scheme, initiated popularly, and not primarily in the United States, has more chance of meeting Russian approval, or more accurately stated, of avoiding open and active Russian opposition, than one initiated by the American government, which is certain to be branded as "imperialistic" in present circumstances. Any scheme encountering active Russian opposition, is bound to fail of attracting the Eastern European states, and is likely to be boycotted by Western Europe through fear of Russia.

Finally one remark should be made about the advantage of a popular referendum in many countries. The possibilities of obtaining ratification of any constitution of a world government in one country will always be influenced by the opinion of the statesmen of that country about the likelihood of ratification elsewhere. A very successful popular vote for the Constituent Assembly in any of the democratic countries, say in the United States, would make eventual ratification by that country of a reasonable constitution quite likely. The knowledge of this would immeasurably increase the likelihood of ratification in many other countries.

Any advance towards world unification must go by steps, and one of the most valuable steps, needed in the near future, is an assurance, by popular demonstration, that world unity is really desired by the people of the world.

THE PLAN PROVIDES DEFINITE STEPS

The atomic scientists have shown a strong tendency to believe that unification, in the form of a world government strong enough to prevent wars, was an eventual necessity. They have differed greatly in their opinions about the exact character of the most desirable union, and as to how it could be achieved. The difference in opinion as to the form of government will always remain, and must be settled eventually, as Usborne proposes, in convention of the peoples of the world.

The PWCA plan neither militates for or against the schemes previously proposed in our group, but does propose a method by which, in concrete limited steps, the world can proceed forward towards what most of us feel is an eventual necessity.

The attainment of world government is a gigantic task which can be arrived at only by the combined efforts of many. The PWCA plan offers a definite series of limited steps in which the help of the many enthusiastic supporters of world government can be enlisted for active and specific aid. The steps proposed have the great advantage over many previously suggested in that they do not increase the likelihood of precipitating the catastrophe of war which we so dread.

MEMORANDUM TO THE UN — ON BACTERIAL WARFARE

American Association of Scientific Workers

The following memorandum was submitted to the General Assembly of the United Nations on September 26 by the American Association of Scientific Workers. The memorandum outlines the problem of bacterial warfare and proposes a course of action for the UN. The bibliography that accompanied the memorandum points to the existence of a growing body of relevant material of which the BULLETIN has selected less than half as examples of both the popular and the technical treatment of the subject. Numbers in parentheses refer to items in the bibliography.

STATEMENT OF THE PROBLEM

Bacterial (or biological) warfare comprises the use in war of pathogenic bacteria, fungi, protozoa, rickettsiae, viruses, and other agents of infectious disease, of their toxic products, and of certain other organic chemical poisons (animal or plant toxins, plant "hormones"), intended to kill or incapacitate human beings or economically useful animals, or to destroy or damage food crops or other useful plants. Bacterial warfare is known (1) to have been under investigation and development by Germany and Japan, and as a joint project by the United States, the United Kingdom and Canada. The American bacterial warfare project is continuing (9).

As of January 3, 1946 (1), wartime studies of bacterial warfare in American, British and Canadian laboratories were officially stated to have shown "that this type of warfare cannot be discounted." Since bacterial warfare in its modern form has not actually been used in a military operation, no precise estimate of its effectiveness can be made. Published data that might indicate the potential activity of its agents are scanty. It has been suggested (5) that botulinus toxin, as crystallized by American bacterial warfare scientists (10, 12), contains per gram about 7,000,000 lethal doses for man. Being a poison, not an agent of self-propagating disease, this substance would be expected to be less potent than infectious material. The hemolytic streptococcus, a common pathogenic bacterium not considered important as a bacterial warfare agent (4) would probably be many times as active against man on a weight basis.[1] A routine unpurified preparation (chick embryo yolk sac suspension) of psittacosis virus, a representative member of the group of highly infective disease agents characteristic of bacterial warfare (4, 29-32) has been reported to contain *per milliliter* approximately 20,000,000 respiratory doses for man (42). No published data are available on dispersion efficiency of bacterial warfare munitions, but even if the efficiency were as low as 0.01 per cent, the potency of this material would still be extraordinarily high. Such preparations of psittacosis virus could easily be produced in *liter* amounts in a single small laboratory, with only such equipment and materials as are common to virus laboratories throughout the world. The payload in a psittacosis "bomb," and therefore probably the whole munition, could be small, cheap, and easily turned out in quantity.[2] Although bacterial warfare comprises a varied range of agents and techniques, these circumstances may serve to exemplify it and to contrast it with atomic warfare, which is known to require enormous amounts of expensive materials and equipment, huge installations, and a very high level of industrial potential and technology.

Bacterial warfare comprises a varied and flexible group of weapons. It could be used to destroy men, animals or plants selectively—or merely to make them useless, and, if desired, perhaps only temporarily. Unlike the atomic bomb it would not destroy property. It is the pre-eminent terror weapon, because its effects would always be delayed rather than instantaneous, and because it would employ strange or altered or artificially combined diseases. It might be used to produce casualties in large numbers, or in such a way that only a few cases would be needed to demoralize a whole population. Bacterial warfare epitomizes the total war that is now or will very soon be ready for use.

Among the diseases whose agents are listed in the appended technical bibliography as having been investigated during World War II for purposes of bacterial warfare are: botulism, a rare and highly fatal form of food poisoning; anthrax; tularemia or rabbit fever; brucellosis or undulant fever; glanders; psittacosis or parrot fever; rinderpest of cattle; Newcastle disease of poultry; fowl plague; fungous diseases of plants; and plant poisoning with synthetic "hormones". It is probable that many other disease agents could be used(4).

BACTERIAL WARFARE CONDEMNED

Bacterial warfare production could proceed in any civilized country irrespective of its size or relative wealth (1). Since it could employ the facilities of normal medical and biological research and development, bacterial warfare could hardly be controlled by an international policing authority without interference of a most inti-

[1] Hamburger, M. G., Puck, T. T., Hamburger, V. G., and Johnson, M. A. Studies on the transmission of hemolytic streptococcus infections III. Hemolytic streptococci in air, floor dust, and bedclothing of hospital wards and their relation to cross ventilation. *J. Infec. Dis.* 75: 79-94 (July-Aug.) 1944.

[2] It may be noted that a vaccine of unproved utility has been developed against psittacosis virus and that this virus, unlike most others, is amenable to chemotherapy. These facts would doubtless have defensive value. Yet the whole problem of defense against bacterial warfare appears extraordinarily difficult, so that it does not essentially modify the argument developed herein.

mate sort with activities upon which the health and welfare of nations depend. Yet it is plain that bacterial warfare constitutes an extremely serious potential menace, and that world peace demands the elimination of this major weapon of mass destruction.

COURSE OF ACTION RECOMMENDED

During July both the International Congress for Experimental Cytology, at Stockholm, and the International Microbiological Congress, at Copenhagen, adopted resolutions condemning bacterial warfare (7, 8). The Cytological Congress set up a committee to offer technical advice and assistance to the United Nations on this problem.

Since bacterial warfare falls into the category of major weapons of mass destruction, the problem belongs with that of atomic warfare within the province of the United Nations Atomic Energy Commission. This body, which up to now has dealt only with atomic energy, is responsible, in the eyes of the peoples of the world, for paving the way for general disarmament and peace. It is therefore imperative that the Atomic Energy Commission proceed without delay to consider bacterial warfare even as its deliberations on atomic energy continue. Since the problem of bacterial warfare is very different from that of atomic warfare, there is no reason to assume that the accomplishment of the control of atomic energy would necessarily have the slightest value in the solution of the problem of bacterial warfare. On the other hand, parallel examination of bacterial warfare and atomic warfare by the commission may disclose new means whereby both may be eliminated.

The American Association of Scientific Workers therefore hopes that the United Nations General Assembly will take cognizance of this matter, that it will undertake a preliminary investigation of the available factual information on bacterial warfare, and that, if the findings of such an investigation warrant such action, it will instruct the Atomic Energy Commission to proceed at once to devote part of its attention to this major weapon of mass destruction.

The appended bibliographies are provided to facilitate such investigations.

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The Story of Alsos

(Continued from Page 354)

by the ease and completeness with which the German secret—not very secret—project was disclosed when the very first German physicists were interrogated at Strassbourg. The reviewer remembers the exciting days of poring over their notes and interviews in Washington to confirm the *Alsos* conclusion that here was the whole unimpressive story of the Nazi effort.

Surely this points to the difficulty of preserving a scientific secret. Not only had the Germans started on much the same track as we had done, but any link with the world of German physics was enough to prove it. Such secrets are hard to keep, and should be especially hard to preserve from the authorized inquirers of an Atomic Development Authority in any country.

Goudsmit himself takes pains to emphasize that German science had atrophied because of its arrogance and complacency, its narrow political domination, with the barring of many of its greatest men from work or even from the land itself, and its increasing emphasis on technology. Those are certainly errors we come very close to repeating in 1947. A curious controversy has arisen around the story of Werner Heisenberg, scientific head of the somewhat desultory German project and among the world's first physicists. He has lately tried to claim that the motivation for the German work was a peaceful one, since they wanted not bombs but merely a pile.

HEISENBERG'S STORY A RATIONALIZATION

The careful story put together by Goudsmit demonstrates this account to be essentially a rationalization invented while some of the participating physicists were interned in England. The documents cited in *Alsos* prove amply that, no different from their Allied counterparts, the German scientists worked for the military as best their circumstances allowed. But the difference, which it will never be possible to forgive, is that they worked for the cause of Himmler and Auschwitz, for the burners of books and the takers of hostages. The community of science will be long delayed in welcoming the armorers of the Nazis, even if their work was not successful. Men were able to remain aloof from the German war effort, and brave and good men like von Laue and Gentner could resist the Nazis even in the sphere of science. That is a story *Alsos* does not fully tell.

Alsos is a book to read if you are fascinated by spying or if you want to know what science became in wartime Germany. It is too bad that many important acts of Alsos and many of its findings are still secret, and others still told best in Professor Goudsmit's urbane conversation. If you don't know him, and you can't read the G-2 files, buy *Alsos*.

proach the pile during its operation? Prediction from past experience was unsatisfactory. When it awoke no new fear, it did not allay the fear of undue optimism engendered by extravagant extrapolation.

Means were found to make the necessary tests. Instruments hitherto unavailable to chemists were put at the disposal of the radiation chemical section. Groups located at cyclotrons, Van de Graaff generators, and eventually at piles at various sites throughout the country experimented on the effects of high-speed deuterons, neutrons, and electrons in some cases at energy and intensity levels far in excess of those to be anticipated in normal atomic-energy operations. Every material of construction was subjected to tests designed to preclude the possibility of tragic break-down during operations. Some materials were discarded and some were improved. Specifications were set upon the basis of which radiation safety (for example, against corrosion) could be assured.

A philosophy of skepticism governed the actions of the section. Anything untried, that could be tested, was tested. Materials that could not be tested were avoided unless there was a sound basis for reasoning from suitable tests on related materials.

The results of most of the extensive tests by the radiation chemistry section will ultimately be published. Some preliminary reports have already been declassified. It is sufficient in this place to say that the successful operation of the pile and the production of plutonium are testimonials that whatever radiation difficulties were anticipated either did not exist or were solved satisfactorily prior to the time of operations.

VALUE TO PURE AND APPLIED SCIENCE

During the course of the experimentation which was a necessary precedent to operations it became more and more apparent that studies in radiation chemistry were important not alone because of the assurances they gave concerning the adequacy of design and processing at the expected high radiation levels. Quite apart from such purely service values, the studies were beginning to give intriguing leads as to the behavior of molecules not only when greatly excited but also under conditions common in most chemical operations. Thus, from the point of view of the research man, radiation chemistry had regained some of the esteem in which it was held when atomic power was still unconceived.

There is a peculiar virtue, in science, in those matters which are remote from practicality. Radiation chemistry, fortunately or unfortunately, is no longer in that category. However, the fact that studies in this field help to interpret the behavior of matter even when atomic energy is not involved make radiation chemistry slightly more palatable to the "pure scientist".

Furthermore, during this preliminary period prior to pile operations, another development in radiation chemistry similarly served to intrigue engineers.

It was well known to the chemists engaged in this field that high-energy electrons from discharges and radioactive emanations produced a variety of strange chemical phenomena in materials ordinarily considered inert. Thus, natural gas could be made to react with water, diamonds could be colored, and a variety of startling changes could be produced in such diverse materials as petroleum, glass and rock. Incidentally, to their other activities, the radiation chemists discovered that some rather useful changes could be thereby induced.

The fact that radiation from an atomic energy pile is so cheap means that chemical processes, in which radiations are deliberately employed to produce effects either in or near a pile, may have real significance in the age we are about to enter.

The atomic energy projects are not beyond the pioneering stage. We have atomic energy but we do not in any real sense have atomic power. Vast forward steps are required and once again problems arise because of difficulties of extrapolation.

PROGRESS LEADS TO NEW PROBLEMS

The plants that we will construct in the next few years will probably not operate at power levels any higher than those of the piles now existent. The power of the present piles is, however, wasted. If it is to be used, it appears essential that the new piles be much smaller units operating more intensely and at higher temperatures. Materials of construction will have to be changed. The heat-exchange medium may no longer be water. Metals and ceramics may play a more important role and the shield materials will be exposed to new magnitudes of radiation. The high temperatures involved will make necessary some fundamental studies in the behavior of the various proposed structural and operating members, new developments will occur and the effects of radiation under the new conditions imposed by ultra-high intensity operation will have to be studied.

Radiation will also become a more serious limiting factor on the economics as well as the method of the various chemical operations attendant on pile operation, product isolation, and metal recovery. It may be expected that within the next few years developments in this field will proceed at an even greater intensity than during the war years.

EFFECT ON BIOLOGICAL MATERIALS

Early in this resume we examined briefly the original discoveries of the effects of high-energy radiation on biological materials. The story of these effects is properly the subject of another article. However, it should be pointed out that one phase of the research necessary to the elucidation of these biological phenomena is essentially radiation chemistry. For example, various organisms differ fundamentally in their response to various dosages, intensities, and types of radiation.

If these effects are to be understood they will require the close cooperation of the radiobiochemist, the radiobiophysicist, and the radiation chemist. The latter has already discovered that different types of radiation act differently on the same chemical systems. The specific effect of intensity is a not uncommon phenomenon in chemistry related to the mechanism of the chemical processes involved. It is possible that the specific effects noted in biological systems, studied as essentially chemical processes, may help in the interpretation of what are ordinarily considered as purely biological phenomena.

In concluding these comments we may revert for a moment to consideration of the purely utilitarian aspects of radiation chemistry. In 1946, the Baruch Committee included in its report to the UN Atomic Energy Commission a statement on the practical applications of radiation chemistry. I can do no better than to quote from that report.

"At present prediction of definite processes in which radiation chemistry will be of great technical importance is premature. It is not too early, however, to enumerate groups of processes where application of radiation chemistry appears promising.

"We may anticipate economic advantages in the vast field of polymerization processes which are now so successfully applied in the manufacture of plastics, rubber, etc,; in this field, in fact, initial successes have already been obtained. In a similar connection, studies even prior to the war on the effects of radiation on some of the constituents of natural gas indicate that they may be converted, via the medium of radiation chemistry, into industrially important products. Their present uses (e. g., in the production of carbon black or for fuel) are economically unsound.

"Related to such processes in a certain sense is the low-temperature cracking of oils, which should be intensively studied. Radiation chemistry here presents the opportunity of a new technique which may produce new and very interesting products.

"A host of rare but medically important drugs, until now synthesized only by plants but not in vitro, will probably be by-products of the utilization of radiation chemical processes. Very interesting preliminary photochemical effects on viruses have been reported; viruses may be made to lose their virulence while still retaining their ability to produce antibodies. Progress in this important field is limited by the lack of penetration and the specificity of the rays which must be used; radiation chemistry should promote such work at an accelerated pace. The chemical aspect of the large field of biologicals is a portion of the field of radiation chemistry which we are now just beginning to tap.

"Some notion of the vistas which lie before us, when we begin to understand primary effects a little better, is indicated by the suggestions of the medical use of specifically absorbed radioactive dyes and of the possible large-scale production of vaccines.

"In continuation of considerations of the effect of radiation on biological substances, we note briefly that such radiation has great possibilities in large-scale sterilization. In fact, such a process may be an important, if secondary, application of operating piles. The suggestion has even been made that in the atomic age of the future the power plant of a city will be an integral part of the sanitary system providing, incidentally to its principal function, pure water and sewage disposal.

"In the fields of inorganic chemistry and physics the production of new phosphors and of inorganic polymers should be studied. Possible hardening of metals by radiation and a host of new enterprises made possible by the interesting process of dislocation of atoms in solids may become important. Anticipated large-scale production of long-lived radioactive materials in association with suitable phosphors makes less remote the day when cold light becomes an industrial reality."

Toward A National Science Policy

(Continued from Page 358)

ceded that we have been weakest in fundamental research, and that strong measures are required to strengthen this aspect of our science. But the present tendency appears to be strongly in the opposite direction, with available funds for research bearing on industrial, military, and health problems enormously overbalancing those available for research having no obvious immediate practical importance. We are in grave danger that our universities will become adjuncts of, and recruiting grounds for, the laboratories devoted to application. Here again goes the goose that lays the golden egg.

As scientists we cannot escape our share of responsibility for the present hazardous state. Congressmen who were interviewed displayed a flattering interest in the views of scientists and their organizations on national science legislation, but many confessed their lack of knowledge of details of the legislation and stated that they had had little advice from home to guide them. One remarked ruefully that, if this were a labor issue, he would have heard from every labor leader in his district. He was forced to conclude that scientists were not very much interested one way or the other.

It must, indeed, be regarded as amazing that individual scientists have made so little effort to influence the legislation, considering the inescapable effect on science and on their personal future that the establishment of a National Science Foundation must have. National scientific organizations banded together in the Inter-Society Committee, and their representatives participated in committee hearings. But when the chips were down and the individual legislators were making up their mind on how to vote, there was very little pressure of the kind that counts—communications from individuals, colleges, institutes, societies, and academies in the *home districts*.

With the formation of the Inter-Society Committee at Boston in December 1946, was there a complacent tendency on the part of individual scientists to over-estimate the potential effectiveness of this organization, with a resulting decline in other types of activity? Have we misread the tactical picture assuming the issue to be National Science Foundation, yes or no? The Inter-Society Committee spoke strongly and effectively in favor of the establishment of a National Science Foundation, but was much less clear in its stand on the specific questions which lay at the heart of the controversy and prevented a successful outcome for the bill. Do recent events indicate that the issue is not whether we shall have a Foundation, but, rather, what kind of a Foundation we shall have? What indeed is the proper role of the Federal Government in the support, planning, and direction of science?

As the time for a new Congressional session draws near these are the questions which occupy the minds of observers here in Washington. National science policy will be decided with or without the participation of scientists. But the wisdom of the decisions will in large measure depend upon the forcefulness with which scientists on both sides of the controversy express their considered judgments, both publicly and to their representatives, *now*.

THE CHALLENGE OF OUR TIME

Ernest Oppenheimer

The realization of the threat to civilization involved in atomic warfare brought forth prompt proposals for the dispersal of urban populations. This possibility was discussed in an early issue of the BULLETIN by J. Marschak, E. Teller, and L. R. Klein, ("Dispersal of Cities and Industries", Vol. 1, No. 9). The question of dispersal has been subordinated in recent months to discussions of international politics. Mr. Oppenheimer, a political scientist, trained at the University of Chicago, now shows how the logic of international politics enforces previous arguments in support of decentralization.

More than two years have elapsed since mankind was first faced with the challenge of atomic energy. On August 6, 1945, *homo sapiens* initiated a race with time, a race that would determine his fate. How has he fared thus far? What has the future in store for him?

Man has not yet been able to curb his Frankenstein. International control of atomic energy, as envisaged by the Baruch plan, was repeatedly rejected by the Soviet Union, nor was any effective substitute offered by the latter or by anyone else. As matters stand now, the gulf between the U.S.A. and the U.S.S.R. is so wide, that there is little if any hope for a true solution on an international basis. Such a solution will be feasible only when all nations, including the Soviet Union, realize that they have nothing to gain from any alternative policy.

Is there anything that induces the Russians to believe that they might gain by following a policy which does not safeguard the world against atomic warfare? In order to answer this question, it is necessary to look at the actual and potential power positions of the U.S.A. and the U.S.S.R. respectively.

ADVANTAGES OF U.S. AND U.S.S.R.

The U.S.A. at the present time has these advantages: (1) Monopoly of atomic bombs; (2) most highly developed technological system in the world; (3) location away from direct contact with hostile powers; (4) world's largest navy.

The U.S.S.R.'s advantages are: (1) Vast area; (2) location in the "heartland" of Eurasia, which lends itself to expansive moves in the direction of Europe, the Near East, Central Asia, and the Far East, especially at the present time, when these areas constitute power vacuums; (3) the size of the population and its rate of increase (already there are over 50 million more people in the U.S.S.R. proper than in the U.S.A.; 150 million more if one adds the populations of the Russian-dominated Eastern European countries); (4) the character of Russia's population, accustomed to regimentation and to making immediate sacrifices for possible long-run benefits; (5) most powerful standing army in the world; (6) an ideology with a strong following all over the globe.

If we look at the respective advantages of the two power nuclei, we note that those of the United States are bound to be temporary, whereas those of the U.S.S.R. are bound to increase. Within five, at the most ten, years the Soviet Union will possess the atomic bomb, thus erasing one of the points in favor of the U.S.A. At the same time, she will have increased her industrial production to such a level that she will approach that of the United States, eliminating a second advantage of the latter.

Finally, while the location of the United States assures her against any immediate attack by land, and while her navy may protect her against sea attack, neither can prevent air attack. Moreover, the decisive battles of any future conflict would most likely be fought on the Eurasian continent. The very fact that the United States is situated away from the areas where Russia might conceivably engage in expansive moves makes these areas all the more vulnerable.

Thus from a prospective point of view the United States is in a rather dire position, much more dire than most people realize. What, if anything, can be done about it?

One "solution" repeatedly expressed by "realists" who are not realistic enough to evaluate all the relevant factors is to engage in a so-called "preventive war." According to these short-sighted gentlemen the United States should "wipe out" Russia while she still has a monopoly of atomic bombs and a technological superiority.

FALLACY OF PREVENTIVE WAR

What would be the real consequences of such a "preventive war?" In all probability U.S. air squadrons could devastate most of Russia's cities and destroy a large part of her industry. However, even under the most "favorable" circumstances this would not eradicate more than 40 million people (which would still leave Russia a population larger than that of the U.S.A.), nor could the assault destroy more than 50 per cent of her industries. Moreover, the Russian armies could hardly be wiped out by atomic bombs; they would have sufficient reserves of supplies and equipment to engage in large-scale military activities for some time at least. That time would probably be sufficient to enable them to overrun Europe, the Near East, the Middle East and most of the Far East, especially since they can count on the support of strong "fifth columns" in all of these regions. The U.S.A. would have to atom-bomb cities and industrial centers in the

areas overrun by the Soviets, lest the latter obtain new sources of supply. This will not endear the United States to the peoples of Eurasia; many of them may well make common cause with Russia.

Moreover, a mere destruction of cities will not be sufficient to guarantee safety for the U.S.A.; American forces would have to conquer and hold the vast spaces of Eurasia. Regular and guerrilla warfare of unsurpassed magnitude would face them. At the same time, Russian air fleets may attack American cities with "ordinary" bombs and with bacteriological weapons. Consequently, Americans may die from the plague while Russians die from radioactivity. Finally, a "preventive war" would alienate large segments of public opinion at home necessitating in all probability the institution of a totalitarian regime in order to prevent internal collapse.

Thus it is apparent that a "preventive war" is not a solution, not only because it runs counter to the traditions and moral standards of the American people, but also because it would bring about the destruction of the American way of life and would mean the end of the U.S.A. as a great power. If we engaged in a "preventive war," we would commit suicide while we attempted murder.

REASON TO SEEK PEACE

BUT TO FEAR WAR

If a war would prove disastrous to the U.S.A. today, how much more ominous would it be ten years from now when she no longer possesses her present advantages. It is apparent that the United States has every reason to make peace its major objective. Unfortunately, peace cannot be had by mere wishful thinking. Peace can be obtained and maintained only by creating the conditions that will make war unnecessary and/or futile.

Despite repeated disappointments in the past, we should continue wholeheartedly in the endeavor to make war unnecessary by working for long-range settlements of all issues that threaten the peace. We should continue our attempts to strengthen the United Nations and its various functional organizations; we should continue to work on the diplomatic level to reach an over-all agreement with Russia. ....

However, it would be the height of folly to rely merely on the hope that some solution will be found. As long as no true world government exists, as long as there is no international control of atomic bombs and of other forms of mass-destruction, the danger of war exists. A true world government and effective international control of atomic energy cannot be established without the Soviet Union, and the Soviet Union will not cooperate as long as she feels there is a chance for a Soviet world empire.

FILLING OF POWER

VACUUM NOT ENOUGH

How can the U.S.A. prevent the establishment of a Soviet world empire and obviate the danger of war at the same time?

A concomitant execution of the following policies would in the writer's opinion constitute the best guarantee against a Soviet world empire and against war: (1) The endeavor to fill as rapidly as possible the power vacuum on the western, southern and eastern borders of the Soviet Union; (2) defensive preparation against atomic attack, with special emphasis on reduction of the vulnerability of the U.S.A. to such attack.

In regard to the first point, it must be admitted that great difficulties confront the U.S.A. The core areas are Europe, the Near East, and China. Only a United States of Europe would constitute an entity formidable enough to withstand the Soviet Union in case of armed attack. The obstacles to be overcome before such an entity could be created are great. Nationalism, communism, and defeatism stand in the way of union. The Marshall program for the economic rehabilitation of Europe through American help is a step in the right direction, but will not of and by itself solve the basic problem. A true solution can be devised only by the Europeans themselves, with such support as the United States can afford to give.

The Near and Middle Eastern area does not now, nor will it in the conceivable future, constitute a significant power potential. It may be regarded as a no-man's land, its fate being determined by the over-all power situation in the world.

The Far East and especially China constitutes perhaps the most incendiary sphere in the contemporary world picture. Two armed camps, the Nationalists and the Communists, stand opposed to each other and engage in large-scale military activities. If the United States sends aid to the Nationalists, the Soviet Union will undoubtedly retaliate by aiding the Communists. The resulting situation will be very explosive and may well lead to World War III.

For the present, the United States should continue its policy of watchful waiting, but should make it quite clear to the Soviet Government that material support to the Chinese Communists would result in material support for the Chinese Nationalists. The stigma for the resulting consequences would be on the Soviet Union, not on the United States.

As is apparent from this brief survey, the outlook for a speedy eradication of the power vacuums in the Eurasian rimlands is not very promising. It is certainly not promising enough to warrant the assumption that United States security will be assured, or a Soviet world empire prevented, by whatever may happen to the west, south, or east of the Soviet Union.

FOREIGN POLICY

BEGINS AT HOME

Lenin once said that "foreign policy begins at home." This may well be made the watchword of the American people. A United State prepared for any eventuality is the best guarantee against war and against Soviet world empire. How well prepared is the United States against the eventualities that may be expected in an atomic age?

At the present time, while the United States has a monopoly of atomic bombs, no one will attack her or anyone whose territorial integrity she guarantees. However, five to ten years from now the situation will be different. Then the U.S.S.R. (and possibly other countries as well) will

have the atomic bomb. Then someone may dare an attack upon us, under one condition: *If we continue to concentrate our population and industries in cities, while the attacking country has placed her industries underground and has dispersed her population.*

A PROGRAM FOR DEFENSE

There are two ways of frustrating an atomic attack: (1) To destroy the carrier of the bomb before it reaches the target; (2) to have no target.

In regard to the first point, it is obvious that with present means (anti-aircraft batteries, barrage balloons, fighter planes, etc.) no complete assurance against attack can be given. It should be remembered that only a relatively small number of bombs need be delivered to wipe out a disastrous proportion of our population and industries. Only in case an absolute defense is devised can we afford to rely on number one.

That leaves us with the second alternative. The concentration of our population and industries in big cities is a constant invitation to disaster. The Russians realize that they count on the fact that (1) we will not engage in the folly of a "preventive war" and (2) that we will not decentralize and go underground. At the same time, if they are smart (and there seems to be considerable evidence that they are, especially in military matters), they will decentralize and go underground themselves, so that by the time they have the atomic bomb, they will be ready for all eventualities.

If Russia puts most of her industries underground, decentralizes her population, and manufactures atomic bombs, while the United States continues to concentrate her population and industries in cities, the day of world empire may have arrived, and it will not be an American empire.

On the other hand, if both Russia and the United States decentralize their population and place most of their industries underground, an attack by either upon the other will be useless. The two giants will have lost their vulnerable spots; they may still eye each other suspiciously for a long time and will, of course, always look for a new outbreak of weak spots, but as long as *both* are prepared for any eventuality, they will stay in their respective stamping grounds. Under those conditions it is even conceivable that the Russian Bear and Uncle Sam will learn to get along with each other.

The biggest question that confronts us today is: Are the American people *able* and *willing* to bear the cost entailed in moving industries underground and decentralizing the population?

In order to evaluate our ability to carry out the program, we must concern ourselves with (1) the scope of the task and (2) the availability of the necessary raw materials, manpower, scientific and technological know-how, and industrial organization.

That the task of placing industries underground and dispersing the urban population is stupendous no one will doubt. However, it should be remembered (1) that we have a number of years, say from five to ten, in which to achieve our goal; (2) that there is no intention of placing all industries underground or dispersing the whole population.

The five to ten years in which the U.S.A. continues to enjoy the monopoly of atom bombs and/or technological superiority are years of grace. We should never forget, however, that the sandglass is running out, that every second ticking away may bring us closer to disaster unless we take advantage of the time we have.

The most important task for the immediate future is the setting up of an over-all plan of procedure. This plan must be ready before any large-scale movement of industry and population can be initiated. Cooperation of governmental, military, business, labor, and scientific personnel is absolutely essential if the setting up and carrying out of the plan is to be successful.

The plan should take into consideration certain obvious facts. Its main purpose must always be kept in mind: to make the United States safe against any attack by atomic, bacteriological, or other weapons. To attain this objective, concentrations of any kind, be they concentrations of industry, of population, or of transportation facilities, must be avoided or at least minimized.

One way of doing this is to create a series of more-or-less "self-sufficient areas" in various parts of the United States. These areas would be self-sufficient in the sense that even if all communication links with other areas were cut, there would be sufficient industrial and population reserves to enable them to function effectively.

Transportation links can be made less vulnerable by diversification (not relying on any one means of transport), by increasing the number and reducing the size of concentration-points, such as railroad yards, airports, etc., and by minimizing the number of obvious weak spots such as bridges (to be replaced as far as possible by tunnels) and lock-canals (to be replaced by sea-level canals). The population should be spread out (above ground), so that any one atomic bomb could do a minimum of damage. Special attention need be paid to providing proper transportation facilities as well as air-raid shelters for the decentralized population.

DISPERSAL OF INDUSTRY

Industries should be placed underground as far as possible; production of goods should be diversified and decentralized. Stockpiles of strategic materials, especially from sources that are subject to attack (such as oil wells and open-pit mines), should be established in the various "self-sufficient areas." The plan of course, should take full advantage of the experiences gained in this country and in Germany in regard to underground facilities. A great deal of research and experimentation is necessary to discover and develop appropriate sites. A system of priorities must be established to assure an orderly procedure in carrying out the plan.

During the years of the Second World War the United States produced war materials in quantities that amazed everyone, friends and foe alike. We supplied not only our own armies, but also to a large extent the armies of our allies, with equipment for carrying on the campaigns that finally brought victory.

The demands made upon our resources during the war years were much greater than those which would be made upon them for the realization of the plan to safeguard the United States against atomic attack.

In my opinion a total expenditure of $100 billion, spread over a period of five years, i. e. $20 billion a year, would be sufficient to make the United States relatively safe against attack. Of course, this would not safeguard all of our people or all of our industries, but it would immunize a sufficient proportion of them against attack to assure that the United States would not be caught off guard in case of an emergency.

The writer will be the first to admit that $100 billion is a tremendous sum. But what would happen if we did not prepare? If our big cities as they stand today were wiped out, the material cost alone would be more than ten times as high, not to consider the millions of lives that would be lost, or the elimination of the United States as a significant power in world affairs.

COINCIDENTAL ADVANTAGES

Certain incidental advantages would result from the carrying out of the program here advocated. While the program is in progress, we would not need to worry about depression or unemployment of men and materials. The resulting economic stability would greatly strengthen the position of the United States both internally and externally.

Moreover, as sociologists and psychologists have pointed out; urban life is not the most healthy conceivable; a decentralization of cities might well do away with, or at least ameliorate, a great many of the social and psychological evils that now beset our society. The writer wants to emphasize, however, that these advantages are incidental and do not constitute in any sense the main *raison d'etre* of the plan here advocated.

Are the American people ready to make the sacrifices, material and especially psychological, to carry out the above program? Is there not the danger of mass-hysteria with its resulting impetus to ill-conceived action once such a plan is seriously considered? Will we not destroy civilization as we know it when we dismantle cities?

The fact that the writer presents his views to the public indicates that he believes in the essential sanity and common sense of the American people. Moreover, while the writer has no doubt whatsoever that an atomic war would destroy civilization as we know it, he does not hold the opinion that a well-planned, gradual dispersal of population and industries would constitute the denouement of civilized living.

Aside from the fact that one may seriously doubt whether cities have been in history or are today the only or even the main carriers of civilization, it should be noted that the above plan does not call for the dismantling of the objects, instrumentalities, and institutions that constitute the matrix of city life, but merely for their dispersal.

Admittedly, there would also be certain modifications, in our way of life some slight, some profound, as a result of this dispersal, but these modifications would in no case constitute the end of civilization. On the contrary, they would once more affirm the ability of man to adapt himself to a new situation, an ability which constitutes the core and essence of the term "civilized living."

What destiny demands seems clear. It is up to the American people to decide whether or not they are capable of meeting the challenge of our time.

Editorial Comment

The proposal to disperse our population and to place vital industries underground was discussed in the BULLETIN at an early date. In the intervening two years, the danger of atomic warfare has come closer. It is, therefore, fitting that the question of dispersal should be reopened.

The arguments for the proposed dispersal seem sound. The cost of 100 billion dollars estimated in the article is low compared to the estimates made in the BULLETIN two years ago. Discussion of the costs of dispersal seems particularly timely now when we are trying to decide whether America can afford spending a sum of the order of twenty billions on an attempt to maintain peace by rebuilding Europe's economy. The latter plan has its risks; but neither is the dispersal program a full guarantee of security.

Dispersal may have less permanent value than assumed in the article of Mr. Oppenheimer. Bacteriological warfare, for example, may find a dispersed population as vulnerable as the people in a city. Decentralization may in fact become a disadvantage due to delay in medical service.

In spite of this, the measures advocated in the article may well be the most effective means of national defense available to us. The present housing shortage may offer a good opportunity to get dispersal started by supporting new construction in favored areas. Thus the first step in dispersal would help to meet an immediate and pressing need.

URBAN AREAS NEED PROTECTION

Statistical information relevant to Mr. Oppenheimer's article has recently been published. A Census Bureau report of November 4 based on a study made by Dr. Warren S. Thompson, director of the Scripps Foundation for Research in Population Problems, Miami University, Oxford, Ohio, stresses the extreme vulnerability of the United States to attack by atomic bombs by citing the growth of metropolitan areas from 1900 to 1940. In 1940, the report points out, more than 40% of our population lived in urban areas centering around cities of more than 100,000.

Two significant facts were noted: 1) that cities are still growing despite all talk of decentralization and dispersal; and 2) that the growth continues although the population of the urban areas does not reproduce fast enough to maintain itself, but receives recruits from farming areas. This shift from farm to city seems likely to continue, but may be directed toward the centers of the south and west rather than to the northeast and north central regions.

Commenting upon the atomic bomb shelter planned by the *Chicago Tribune*, General Leslie R. Groves recommended that construction of such centers in all large cities begin by 1950. He stressed their potential value to the defense command in keeping communications at work and in providing a center for military intelligence and medical aid. At the same time General Groves expressed doubt that the bomb would ever be used because of the danger of retaliation and self-annihilation, and called it "the most effective agent for universal peace ever created by man".

UNITED NATIONS ATOMIC ENERGY NEWS

Peter Kihss

The BULLETIN offers this first-hand report of events at Lake Success as a regular monthly feature. Mr. Kihss, a staff member of the NEW YORK HERALD TRIBUNE, has specialized in Atomic Energy Commission activities.

During October, the Soviet Union lost a move to tie a new demand for outlawing atomic weapons into a United Nations condemnation of war talk. The majority of the General Assembly political committee took the view that any ban on atomic weapons must be bound up with creation of international controls.

DEVELOPMENTS DURING A. E. C. RECESS

With the Atomic Energy Commission recessed since adoption of its second report to the Security Council September 11, and with the Assembly occupying the time of most delegates, other U. N. developments in the atomic field included:

1. The Assembly elected Argentina and Canada to the Security Council, each polling forty-one votes out of fifty-seven cast September 30. Repeated ballots failed to decide whether the Soviet Ukraine or India should get the third seat left open when terms of Brazil, Australia and Poland expire December 31. Under the pattern by which the Atomic Energy Commission has consisted of the Council nations plus Canada, this means Argentina would join the 1948 commission.

2. Over Soviet objection, the Assembly majority worked on an American proposal for a year's test "Little Assembly" standing committee. Sir Hartley Shawcross, of Great Britain, told the political committee October 17 "it would be folly for any committee to intervene in the (Atomic Energy) Commission sphere, at any rate until such time as that commission or the Security Council have decided either that they need the Assembly's assistance, or wish to convey information to the Assembly, or that further progress is impossible."

3. Dr. Ignacy Zlotowski, Polish member of the atomic commission, said he would ask a discussion of biological warfare before his nation leaves the atomic commission this year. When the Assembly first set up the commission, its resolution of January 24, 1946 called on the new agency to study elimination from national armaments of all major weapons adaptable to mass destruction. The American delegation on June 14, 1946, circulated scientific reports calling attention to the biological warfare problem. But the commission has concentrated on atomic energy, as a basic problem in which control of uranium and thorium enables a unique technological control.

DEBATE OF ASSEMBLY'S POLITICAL COMMITTEE

The atomic issue came before the Assembly political committee as a result of a Soviet resolution to demand condemnation of war propaganda by reactionaries "in particular in the United States of America, Turkey and Greece," and to call for government prohibitions of war propaganda by criminal penalties.

Fourth and final paragraph of the Soviet resolution was: "The United Nations affirms the necessity for the speediest implementation of the decision taken by the General Assembly on December 14, 1946 on the reduction of armaments, and the decision of the General Assembly of January 24, 1946, concerning the exclusion from national armaments of the atomic weapon and all other main types of armaments designed for mass destruction, and considers that the implementation of these decisions is in the interest of all peace-loving nations and would be a most powerful blow at propaganda and the inciters of a new war."

A digest of atomic phases of the committee debate follows:

October 22. Opening debate, *Andrei Y. Vishinsky*, Soviet Deputy Foreign Minister, said the Assembly disarmament resolution, which set outlawry of atomic weapons and early establishment of international controls as an "urgent objective," remains unfulfilled.

"But its implementation is an imperative necessity," he said, "for this resolution affects the interests of millions and millions of people still carrying on their shoulders the burden of war expenses." U. N. affirmation of the need for "early execution" of the arms and atomic resolutions, Mr. Vishinsky said, "would be an act of paramount importance and would be in the interests of strengthening peace and security of nations."

External Affairs Minister *Herbert V. Evatt*, of Australia, offered an Australian amendment, which, among other things, omitted the atomic problem. Dr. Evatt said he would welcome a full atomic discussion when the committee later dealt with the Security Council report.

"In some respects, I think, as I can show perfectly clearly," Dr. Evatt said, "the reasons for the delays in the Atomic Energy Commission and the adoption of its report and consideration of it by the Security Council and by the General Assembly must be borne by the Soviet Union—a very large part of that responsibility at least. . . . .

"Admittedly the Security Council and its subsidiary organs have made far too little progress in the past two years in such matters as the control of atomic energy and conventional armaments, and this delay is weakening public confidence in the effectiveness of the United Nations to preserve international peace and security.

"Let us then do all in our power to work together and to widen the area of agreement between us. Let newspapers and public speakers in all countries also cease to talk about using the atomic bomb first and cease spreading any gospel of the inevitability of war."

October 23. Brigadier General *Carlos P. Romulo*, of the Philippines, said peace can be safeguarded by, among other things, "our agreeing as speedily as possible on the control and regulation of armaments, especially atomic armaments as provided in Paragraph 4 of the Soviet resolution which does make sense, but which, unfortunately, is here placed in the wrong context and is wholly irrelevant to the preceding paragraphs of the resolution.

PROHIBITION VERSUS CONTROL

"Indeed, Mr. Chairman, the manner in which the last paragraph is tacked on at the end of the resolution would seem to have been deliberately intended to confuse and mislead, and to place the responsibility for the non-implementation of the resolutions we approved last year on armaments regulation and reduction upon the United States. The device is patently dishonest. It reveals the highly dubious motive which inspired the resolution, and on this account alone, if on no other, it does not deserve more serious consideration than we have already given it."

Warren R. Austin, of the United States, complained the Soviet proposal diverts attention from practical programs for removing causes of war —"distress, despair, hunger and ill health," the creation of U. N. police forces, the control of atomic energy. By ten votes to one, with one abstention, the atomic commission had approved its interim report on functions of an international control agency.

"The Soviet Union alone voted against this interim report," Mr. Austin said. "It has continued to urge prohibition before control is set up." The proposed resolution spoke only of outlawing atomic weapons, he went on, and "its silence is more eloquent than what it says, when it omits the balance of the resolution" of January 24, 1946, which called for effective safeguards as well.

"The majority of the commission which has worked assiduously for these many months on the problem of atomic energy control," Mr. Austin said, "knew that an exchange of pious promises not to use atomic weapons is of no value, except as a part of a fully effective system of control. Without such control, no treaty would provide the security which the world demands. . . . It would be an actual fraud upon the public, unless it realized the limitation, if they thought it would protect them when in fact it did not. . ."

J. L. Ilsley, Canadian Minister of Justice, took the same view, introducing his own substitute resolution which also omitted atomic reference. The majority of the atomic commission, he said, had insisted that effective control "cannot be achieved either by a mere diplomatic document saying that the manufacture and use of atomic weapons is being prohibited, nor by the later Soviet proposal that periodic inspection and check is sufficient."

WARMONGERING AND DISARMAMENT

October 24. Foreign Minister *Dmitri Z. Manuilsky*, Ukrainian Foreign Minister, called the question of war propaganda "second in importance only to the problem of control of atomic energy and reduction of armaments." The three issues were "necessarily linked in any workable program for peace." Propaganda in reactionary circles of the United States had created such war hysteria, he said, as to prevent agreement on atomic energy, disarmament and world police forces. The Australian proposal, he said, was "utterly incorrect" when it deleted the disarmament clause "in a vain effort to bypass questions that were unpalatable to the United Kingdom and the United States."

J. H. Van Roijen, of the Netherlands, called the Soviet atomic clause "out of place in this resolution and moreover incomplete and misleading in its citation of the General Assembly resolution of January 24, 1946."

Carlos Eduardo Stolk, of Venezuela, saw no need to link up warmongering and disarmament. "A close study would have to be made of all the aspects of the problem to determine whether or not the General Assembly should make a recommendation," he said. "If so, the scope of that recommendation ought to be carefully defined."

V. K. Wellington Koo, of China, said the Soviet atomic clause contained only "the negative, passive aspect of control, namely the exclusion from national armaments of the atomic weapon." Effective safeguards, he said, were "an indispensable counterpart of exclusion."

The 10-1 vote on the second atomic report, Dr. Koo said, led to the "wish that there had been more cooperation so that unanimous agreement could be reached, thereby paving the way for its effective implementation. This, in our view, is the more necessary because progress in the work of the Commission for Conventional Armaments must necessarily depend upon a solution of this vital problem of atomic and other weapons of mass destruction.

"If the spirit of cooperation is lacking, another resolution of the General Assembly will not bring about more rapid progress, but will only serve to call attention to the failure to reach agreement and the underlying cause for this failure."

Maurice Couve de Murville, of France, said "the reduction of conventional armaments, the control and the prohibition of atomic weapons are in our opinion essential elements for the establishment of a true peace." But he also argued that the question of disarmament should be discussed in connection with the report of the Security Council, and submitted a French resolution on propaganda, which dropped the atomic clause.

Foreign Minister *Kuzma V. Kiselev*, of Soviet Byelorussia, charged that the disarmament and atomic resolutions had remained "a dead letter because of the United States and the United Kingdom," and asserted "the armaments race is going on."

WAR PROPAGANDA LINKED TO ARMS MANUFACTURE

October 25. Foreign Minister *Jan Masaryk*, of Czechoslovakia, supported some positive action against war propaganda, and said this was definitely connected with the speediest implementation of the arms resolutions. "Moral and material disarmament should go hand in hand," he said.

Alfonso Lopez, of Colombia, wondered how it was possible to prevent warmongering when East-West disagreement appeared to be intensifying. No accord had been reached regarding peace treaties, atomic controls or disarmament. No progress had been made in conciliation since the last session of the Assembly, he said.

Hector McNeil, British Minister of State, said: "I do not pretend, or attempt to pretend, that there is no relation between the uncontrolled private manufacture of arms and propaganda in favor of war. There is unfortunately too much evidence on the subject of uncontrolled manufacture of arms and its co-relation, propaganda, for me, as a member of my government, to shut my eyes to this fact."

The British Laborite said there would doubtless be a full disarmament discussion at the appropriate time, and added: "Equally, I fear that the committee will have the greatest difficulty persuading themselves when they examine the evidence that the representatives of Soviet Russia have not been primarily responsible for the lack of progress on this essential and urgent subject."

COMPROMISE RESOLUTION ON WARMONGERING

October 27. Australia, Canada and France succeeded in blending their views into a joint resolution to (1) condemn all propaganda which might disrupt peace, (2) request governments to promote friendly relations by available publicity and propaganda, (3) transmit this resolution to the Conference on Freedom of Information, meeting in Geneva next March. This omitted any atomic clause.

Mr. Vishinsky declared it would be "ridiculous" to speak against war propaganda, and at the same time to increase armaments.

"We do not suggest any solution," the Soviet delegate said. "We simply say the United Nations affirms the speediest implementation of the General Assembly resolution. Isn't it one of the measures that would redound against war? . . . . You are not against that? Or are you?"

The Soviet resolution was rejected by paragraphs. On the atomic clause, the vote was forty to seven against it, only Egypt joining the Slav bloc (the Soviet Union, Byelorussia, Czechoslovakia, Poland, Ukraine and Yugoslavia), with seven nations abstaining. The joint resolution against war talk then won committee approval, 56-0, with Haiti absent, and was sent to the full Assembly.

MEMORANDUM ON BIOLOGICAL WARFARE

On biological warfare, *Dr. Zlotowski* told reporters Oct. 3 that he would bring that issue up in the atomic commission, after an eleven-page memorandum had been circulated to Assembly delegates by the American Association of Scientific Workers.

The very existence of biological weapons, the Polish delegate contended, demonstrates that "it is absolutely necessary to have as a first step the immediate prohibition of weapons of mass destruction.

"From the point of view of atomic control, one may argue that this prohibition is meaningless as long as we don't have the mechanism to inspect development.

"In the case of biological warfare, the value of such a mechanism is extremely doubtful—or impossible. So first, at least, there should be an agreement to prohibit such weapons —for the moral value, anyway."

This view—counter to the majority opinion—would again defer establishment of controls over mass-destruction weapons, pending an initial prohibition.

Dr. Zlotowski argued that the U.N. should work to eliminate causes of war, rather than believe control of weapons would provide real safety. He envisioned a future which would see uranium resources playing the same role in international rivalries as oil has done.

So he contended any control must be such as would least interfere with individual nations' economies, while preventing any country from establishing dominance in the atomic field. Unless war causes were removed, he said, biological weapons would enable a disastrous war even if some nations lacked atomic bombs.

Letter to Stalin

(Continued from Page 349)

POSTSCRIPT

Having presented a number of suggestions outlining in detail—perhaps in too great detail—a course which you might wish to adopt, I feel that I ought to go one step further at the risk that what I am going to say may seem out of proportion with the main theme of this "Letter."

The vast majority of the atomic scientists who take an active interest in matters of public policy are free from any anti-Russian bias and they do not include Communists in either the narrow or wider sense of the term. If I were called upon to do so, I would try to form a committee drawn from their ranks who, *acting as hosts*, would gather a group of American citizens from all walks of life — men who are concerned about the welfare of America and who are also concerned about the welfare of the rest of the world, including Russia. Such a group could meet with similarly constituted groups from Great Britain and France on the one hand, and Russia, Poland and Czechoslovakia on the other hand. Russian scientists would surely cooperate if the initiative were taken by you, and the scientists of all these other countries could then also be counted upon to help in arranging such a meeting.

If the issues which face the world today were freely discussed in such an international group of private persons, after some initial faltering, the picture of a bold and constructive solution of these issues might emerge, and public opinion all over the world might then rally to such a solution.

In governmental negotiations the discussion is always hampered by the fear that once a point is conceded it is difficult to go back on it. But in such a discussion among private individuals it may be possible to deal with the controversial issues in the proper setting of a wider framework, and some of them may then appear reduced to their true proportions.

If a sufficient number and variety of those persons who would participate in these discussions would feel free to present their private opinions as distinguished from the official positions of their own governments, a free flow of thought might ensue, which could make available a valuable fund of ideas and suggestions upon which the governments could draw later on in their negotiations.

There could be, of course, in these discussions, no disclosure of any kind relating to the subject of atomic energy.

Just How Important Is

THE ATOMIC BOMB?

IN these times of mounting tensions, the atomic scientists continue—as they have since the bomb fell on Hiroshima—to tell all who will listen of the social and political implications of their discoveries. Their message is increasingly important: "The responsibility to see that atomic energy is used for the benefit and not the destruction of mankind is ours—and YOURS."

THE scientists do not claim to have all the answers but they are continually exploring the relationship between science and society, between the potentialities of atomic warfare and the survival of civilization. The monthly BULLETIN OF THE ATOMIC SCIENTISTS is their medium for keeping abreast of developments in this field. It should be yours, too, if you are to participate intelligently in the democratic decisions on which our destiny may hinge.

JUST how important is the atomic bomb? The term "atomic age" seems to have drifted into our vocabulary. Its implications are too often absent from our thinking. Recent issues of the BULLETIN OF THE ATOMIC SCIENTISTS show how the problems created by atomic energy impinge on every phase of our existence.

WARFARE. In February, an authoritative article by Edward Teller, "How Dangerous Are Atomic Weapons?", discussed the probabilities of newer, more powerful bombs, capable of producing a radioactive cloud that could endanger a continent. In March, Ansley Coale reported on the problem of reducing vulnerability to atomic bombs—the result of a study made by the Social Science Research Council's Committee on Atomic Energy. In June, Austin Brues' report of his observations with the Atomic Bomb Casualty Commission described the effects of atomic bomb injuries and revealed a previously untold story of the Japanese decision to surrender.

POLITICS. A workable system for the prevention of warfare and the control of atomic energy is the only answer to the political problem posed by the atomic bomb. This year's BULLETINs have carried articles by R. Gordon Arneson, Quincy Wright, Warren R. Austin, Leo Szilard, Aba P. Lerner, Edward A. Shils, Cuthbert Daniel and Arthur M. Squires, Harold C. Urey, Philip Morrison and Robert R. Wilson, David E. Lilienthal, J. Robert Oppenheimer, and others, all dealing with phases of this problem. In addition, the BULLETIN has inaugurated a monthly review of United Nations developments in the field of atomic energy by Peter Kihss, New York Herald Tribune staff member and a notably astute observer of UN activities. The BULLETIN has also printed the texts or careful condensations of major documents issued by the UN and the United States Atomic Energy Commission.

ECONOMICS. BULLETIN readers found in the April-May issue an authoritative report on the costs of atomic power and the economic factors which may affect its use by Sam H. Schurr, co-director of the study of Economic Aspects of Atomic Energy conducted by the Cowles Commission at the University of Chicago.

SCIENCE. Although the BULLETIN is not a technical journal, its articles on the developments in science which importantly affect our civilization have attracted wide interest and comment. Articles by H. J. Muller, Kenneth V. Thiman, Edward Teller, J. Robert Oppenheimer, and others have covered the field from the effects of radiation on the genes and heredity, to the organization of research under the National Science Foundation Bill and the proposed UN Atomic Development Authority.

All these articles, and many more, dealt with problems of vital concern to you. If you missed them, you owe it to yourself as an intelligent citizen, to see that you do not miss future issues, as the BULLETIN continues its coverage of the most important problem the human race has faced since the discovery of fire.

The most important and thoughtful gift you can give your friends this Christmas is a subscription to the BULLETIN OF THE ATOMIC SCIENTISTS. A subscription to the BULLETIN is more than a gift; it is a contribution to your own welfare and the welfare of each of your fellow citizens.

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